Southern Medical Journal

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1. McKenna, C. J.: Am. Pract. & Digest Treat. 6:417, 1955. 2. Moyer, J. H.: M. Clin. North America, March, 1957, p. 405.

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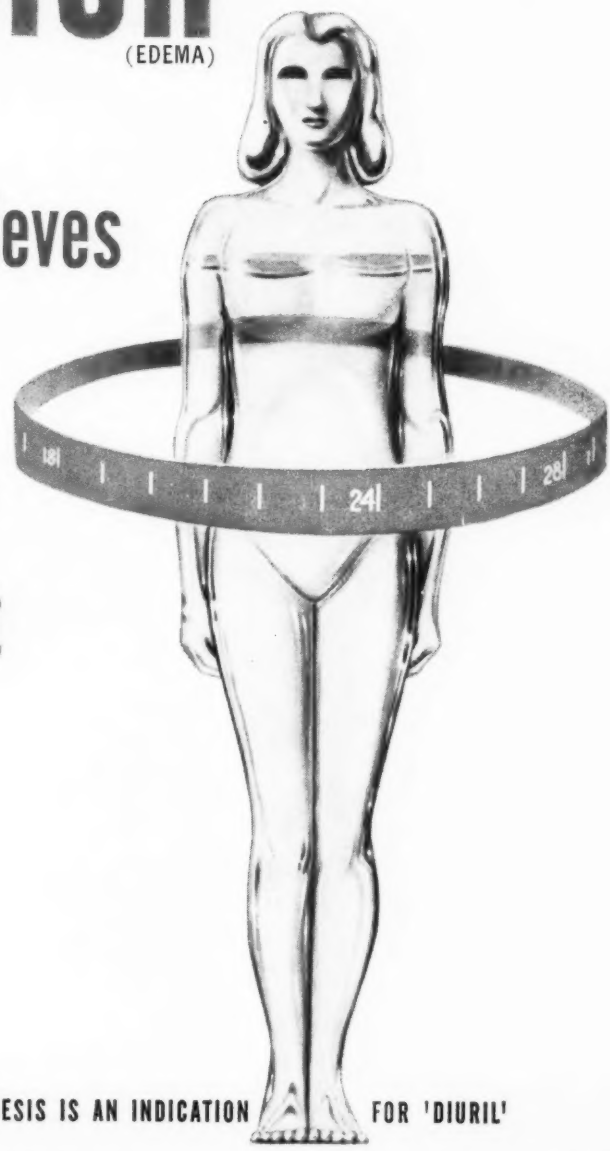

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1. Rein, C. R., Fleischmajer, R., and Rosenthal, A. L.: J. A. M. A. *165*:1821, (Dec 7) 1957.
2. Shelley, W. B., and Pillsbury, D. M.: Personal Communication.
3. Sherwood, A., and Cooke, R. A.: Personal Communication.
4. Freyberg, R. H., Berntsen, C. A., and Hellman, L.: Paper presented at International Congress on Rheumatic Diseases, Toronto, June 25, 1957.
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9. Ibid.: Personal Communication.
10. Barach, A. L.: Personal Communication.
11. Segal, M. S.: Personal Communication.
12. Cooke, R. A.: Personal Communication.
13. Dubois, E. L.: Personal Communication.

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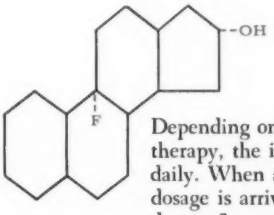

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1. Ponce de Leon, E.: Antibiotic Med. & Clin. Therapy 4:816, 1957.

2. McFadden, H. W. and Musselman, M. M.: Personal communication to Eaton Laboratories.

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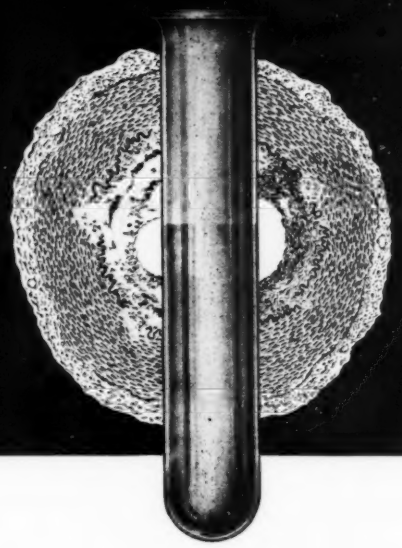

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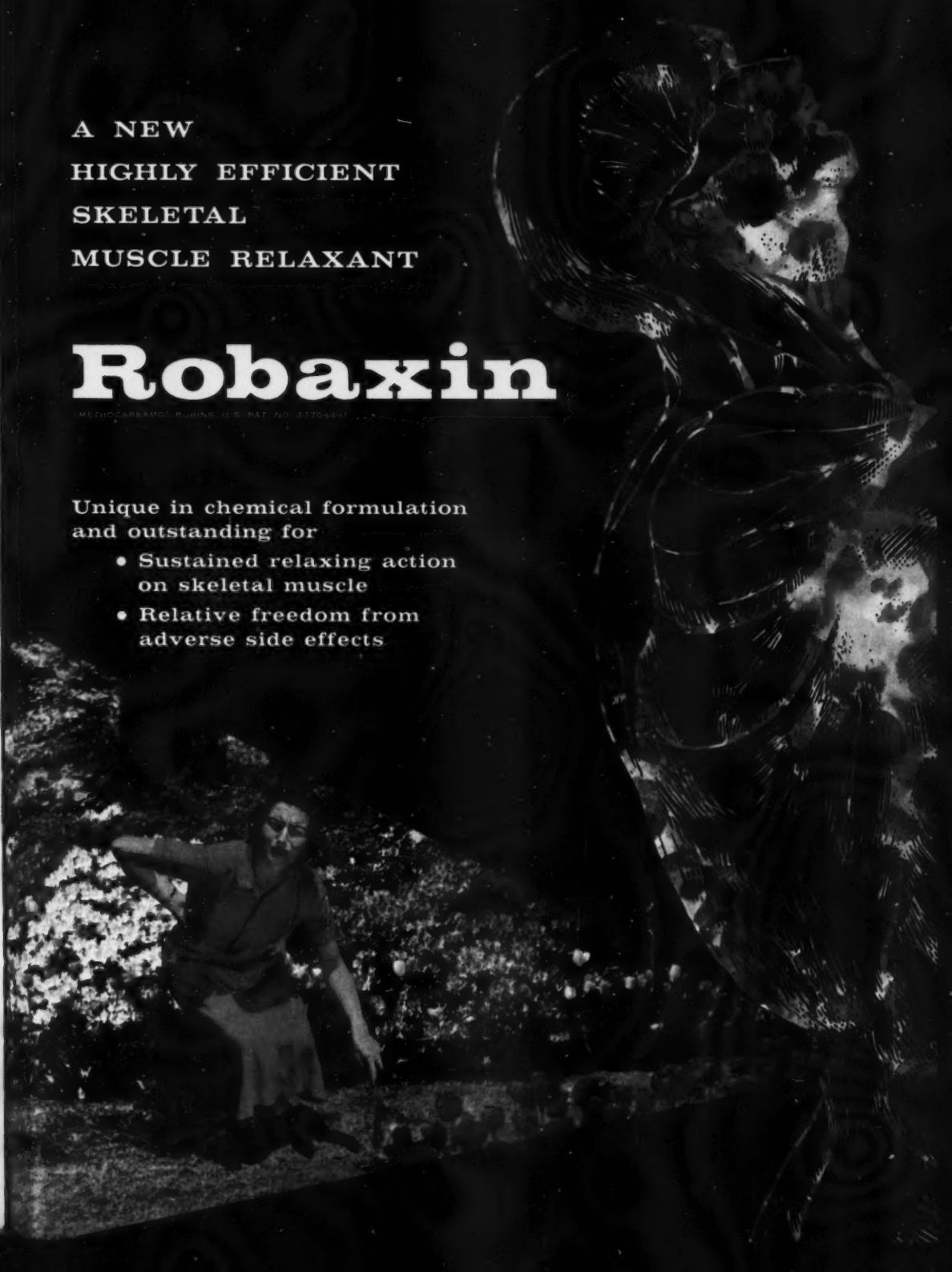

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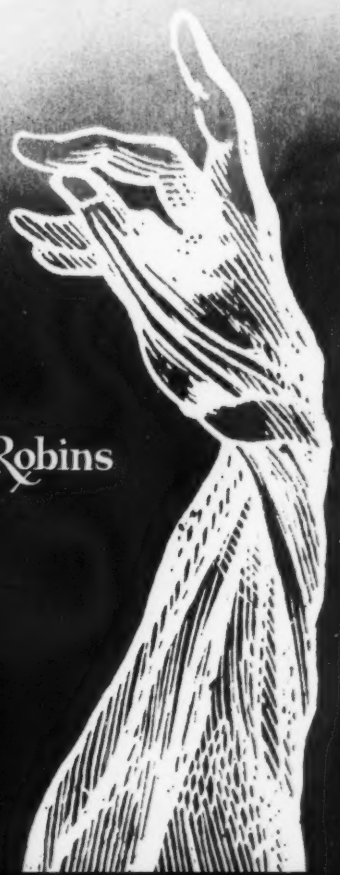
Published References: 1. Carpenter, E. B.: Southern Medical Journal 51:627, 1958. 2. Forsyth, H. F.: J.A.M.A. 167:163, 1958. 3. Little, J. M., and Truitt, E. B., Jr.: J. Pharm. & Exper. Therap. 119:161, 1957. 4. Morgan, A. M., Truitt, E. B., Jr., and Little, J. M.: J. Am. Pharm. Assn., Sci. Ed. 46:374, 1957. 5. O'Doherty, D. S., and Shields, C. D.: J.A.M.A. 167:160, 1958. 6. Park, H. W.: J.A.M.A. 167:168, 1958. 7. Truitt, E. B., Jr., and Patterson, R. B., Proc. Soc. Exper. Bio. & Med. 95:422, 1957. 8. Truitt, E. B., Jr., Patterson, R. B., Morgan, A. M., and Little, J. M.: J. Pharm. & Exper. Therap. 119:189, 1957.

Summary of four new published clinical studies:

ROBAXIN BENEFICIAL IN 95.6% OF CASES OF ACUTE SKELETAL MUSCLE SPASM

CONDITION	NO. PATIENTS	RESPONSE			
STUDY 1[1]		"marked"	moderate	slight	none
Skeletal muscle spasm secondary to acute trauma	33	26	6	1	—
STUDY 2[2]		"pronounced"			
Herniated disc	39	25	13	—	1
Ligamentous strains	8	4	4	—	—
Torticollis	3	3	—	—	—
Whiplash injury	3	2	1	—	—
Contusions, fractures, and muscle soreness due to accidents	5	3	2	—	—
STUDY 3[5]		"excellent"			
Herniated disc	8	6	2	—	—
Acute fibromyositis	8	8	—	—	—
Torticollis	1	—	—	1	—
STUDY 4[6]		"significant"			
Pyramidal tract and acute myalgic disorders	30	27	—	2	1
TOTALS	138	104	28	4	2
		(75.3%)	(20.3%)		



Supply: Robaxin Tablets, 0.5 Gm., in bottles of 50.

for
vaginal
douching
that is
physiologically
sound

ethically promoted

Meta Cine

vaginal douche powder

Meta Cine represents a carefully designed formula which provides the physician with a vaginal douche preparation which safely and effectively maintains a clean healthy vagina.

Meta Cine is a combination of several ingredients clinically established as valuable in promoting proper vaginal hygiene. Diluted for use, Meta Cine possesses the desired pH (3.5); contains the mucus digestant, papain, which dissolves mucus plugs and coagulum; contains lactose to promote growth of desirable döderlein bacilli, and methyl salicylate for soothing stimulation of circulation within the vaginal walls.

Its pleasant, deodorizing fragrance also meets the esthetic demands of your patients.

Meta Cine is promoted exclusively to the medical profession, and recommends itself as your preparation of choice for patients who might otherwise indulge in unsupervised self-medication with potentially damaging nonphysiologic douches.

Supplied in 8-oz. containers. 2 teaspoonfuls in 2 quarts of warm water, douche as prescribed.

Printed douching instructions for patients available upon request.

BRAYTEN Pharmaceutical Company • *Chattanooga 9, Tennessee*

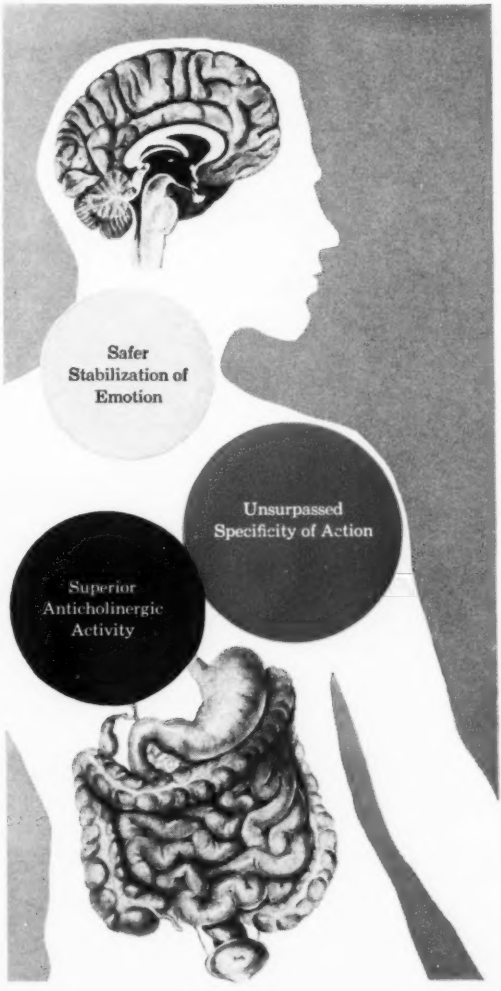
Controls ***Stress***

Relieves ***Distress*** *in* *smooth muscle spasm*

new

Pro-Banthine® *with* Dartal®

— for positive relief of cholinergic spasm. — a new and safer agent for normalizing emotions.



PRO-BANTHINE WITH DARTAL offers you a new, specific and reliable control of visceral motor disorders, especially when these disorders are induced or aggravated by psychic tensions or anxiety.

Pro-Banthine has won wide clinical acceptance as the most effective drug for controlling gastrointestinal hypermotility and hypersecretion.

Dartal, a new phenothiazine congener, offers greater safety, flexibility and effectiveness in stabilizing emotional agitation.

The combination of each drug in fully effective doses in Pro-Banthine with Dartal gives a new means of approach to the medical management of functional gastrointestinal disorders mediated by the parasympathetic nervous system.

Specific Clinical Applications: Functional gastrointestinal disturbances, gastritis, pylorospasm, peptic ulcer, spastic colon (irritable bowel), biliary dyskinesia.

Dosage: One tablet three times a day.

Availability: Aqua-colored tablets containing 15 mg. of Pro-Banthine (brand of propantheline bromide) and 5 mg. of Dartal (brand of thiopropazate dihydrochloride).

G. D. SEARLE & CO., Chicago 80, Illinois.
Research in the Service of Medicine.

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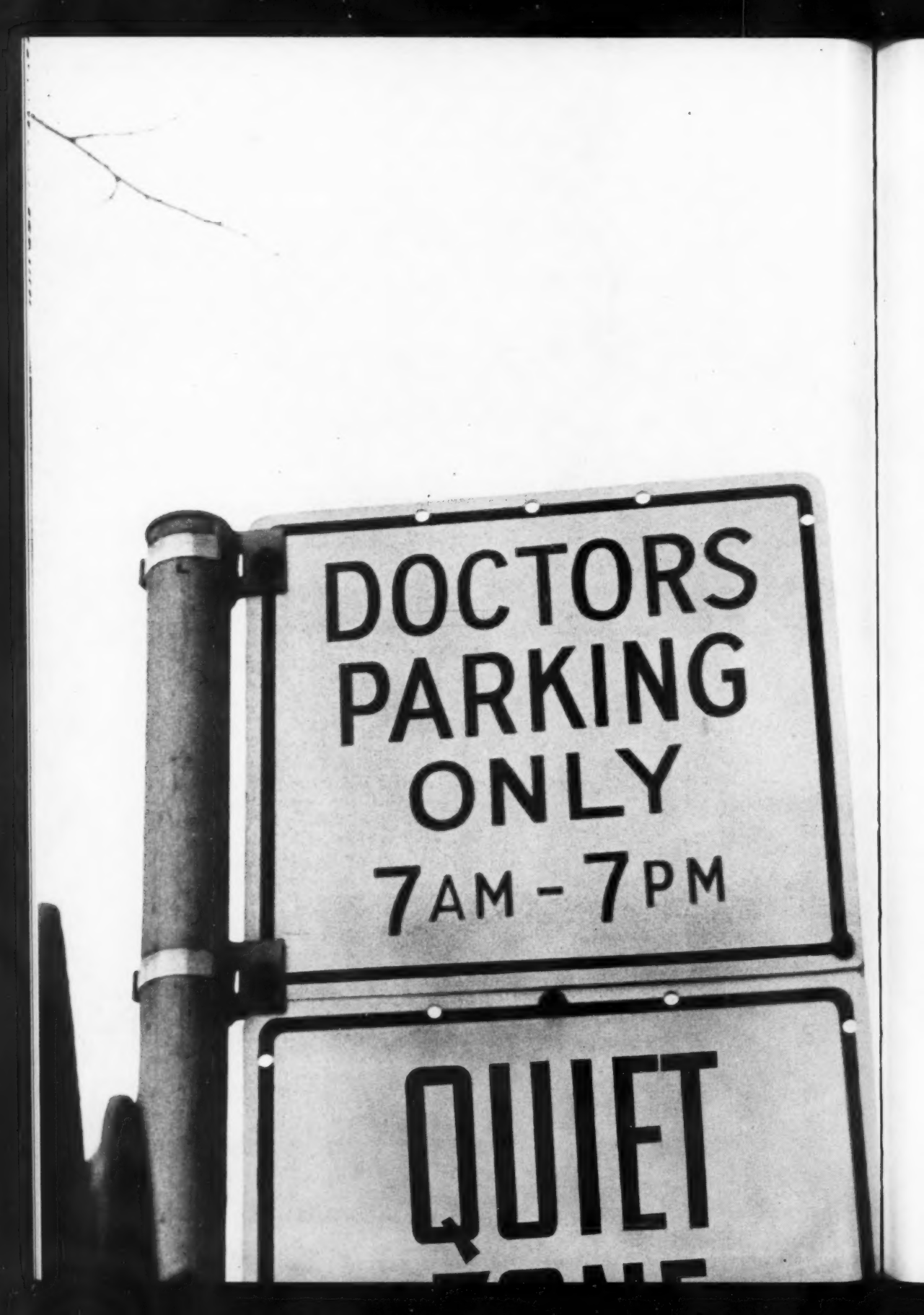
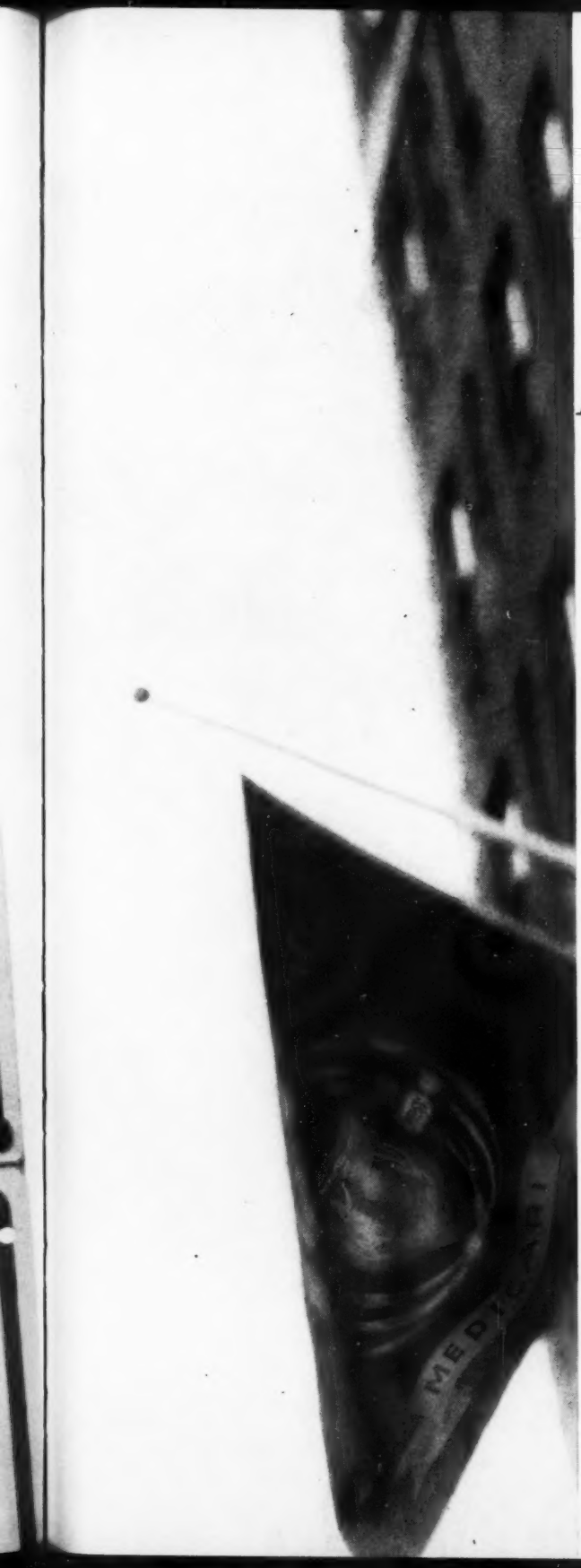

DOCTORS
PARKING
ONLY
7AM - 7PM
QUIET



ACHROMYCIN® V

Tetracycline and Citric Acid Lederle

A Decision of Physicians

When it comes to prescribing broad-spectrum antibiotics, physicians today most frequently specify ACHROMYCIN V.

The reason for this decided preference is simple.

For more than four years now, you and your colleagues have had many opportunities to observe and confirm the clinical efficacy of ACHROMYCIN tetracycline and, more recently, ACHROMYCIN V tetracycline and citric acid.

In patient after patient, in diseases caused by many invading organisms, ACHROMYCIN achieves prompt control of the infection—and with few significant side effects.

The next time your diagnosis calls for rapid antibiotic action, rely on ACHROMYCIN V—the choice of physicians in every field and specialty.

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LEDERLE LABORATORIES
a Division of
AMERICAN CYANAMID COMPANY
Pearl River, New York

Faster rehabilitation in Rh

multiple

M

THE FIRS

Joint inflammation and muscle spasm are the two elements most responsible for disability in rheumatic-arthritic disorders—and MEPROLONE is the one agent that treats both.

MEPROLONE suppresses the inflammatory process and simultaneously relieves aching and stiffness caused by muscle spasm, to provide greater therapeutic benefits and a shorter rehabilitation period than any single antirheumatic-antiarthritic agent.

MEPROLONE-2 is indicated in cases of severe involvement, yet often leads to a reduction of steroid dosage because of its muscle-relaxant action. When involvement is only moderately severe or mild, MEPROLONE-1 may be indicated.

SUPPLIED: Multiple Compressed Tablets in three formulas: MEPROLONE-2—2.0 mg. prednisolone, 200 mg. meprobamate and 200 mg. dried aluminum hydroxide gel (bottles of 100). MEPROLONE-1 supplies 1.0 mg. prednisolone in the same formula as MEPROLONE-2 (bottles of 100). MEPROLONE-5—5.0 mg. prednisolone, 400 mg. meprobamate and 200 mg. dried aluminum hydroxide gel (bottles of 30).

a

Because muscles move joints, both muscle spasm and joint inflammation must be considered in treating the rheumatic-arthritic patient . . .

MERCK SHARP & DOHME Division of MERCK & CO., Inc., Philadelphia 1, Pa. MSD

n Rheumatoid Arthritis

multiple compressed tablets

MEPROLONE®

THE FIRST MEPROBAMATE-PREDNISOLONE THERAPY

b

MEPROLONE is the one antirheumatic-antiarthritic that exerts a simultaneous action to relax muscles in spasm and to suppress joint inflammation . . .

c

Therefore, MEPROLONE does more than any single agent to help the physician shorten the time between disability and employability.

MEPROLONE is a trade-mark of Merck & Co., Inc.

BONADOXIN®

stops morning sickness but..B

*relief with BONADOXIN in 1534 patients**

good or excellent	87.8%
fair or moderate	8.6%
poor or none	3.6%

**Summary of published clinical studies.*

t.. **BONADOXIN®**

doesn't stop the patient

"... tolerance was excellent, with no drowsiness resulting."[1]

"No side reactions were observed...."[2]

Each pink-and-blue tablet contains:

Pyridoxine HCl . . . . 50 mg.
Meclizine HCl . . . . . 25 mg.

Bottles of 25 and 100.

Now also available as
BONADOXIN DROPS

1. Weinberg, A., and Werner, W. E. F.: Am. Pract. & Digest Treat. *6*:580 (April) 1955.
2. Codling, J. W., and Lowden, R. J.: Northwest Med. *57*:331 (March) 1958.

ROERIG

New York 17, New York
Division, Chas. Pfizer & Co., Inc.

PREVENT
both cause and fear of
ANGINA ATTACKS

"In diagnosis and treatment [*of cardiovascular diseases*] *...the physician must deal with both the emotional and physical components of the problem simultaneously."*[1]

The addition of Miltown to PETN, *as in Miltrate, "...appears to be more effective than* [PETN] *alone in the control of coronary insufficiency and angina pectoris."*[2]

1 *Friedlander, H. S : The role of ataraxics in cardiology. Am. J Card.* 1:395, *March 1958.*
2. *Shapiro, S. : Observations on the use of meprobamate in cardiovascular disorders. Angiology* 8:504, *Dec. 1957.*

NEW
dovetailed
therapy
combines
in ONE tablet

Miltrate*

proven safety for long-term use

prolonged relief from anxiety and tension with **MILTOWN®** — The *original* meprobamate, discovered and introduced by Wallace Laboratories

+

sustained coronary vasodilation with **PETN** — pentaerythritol tetranitrate a leading, long-acting nitrate

Miltrate is recommended *for prevention* of angina attacks, *not for relief* of acute attacks.

Supplied: Bottles of 50 tablets.

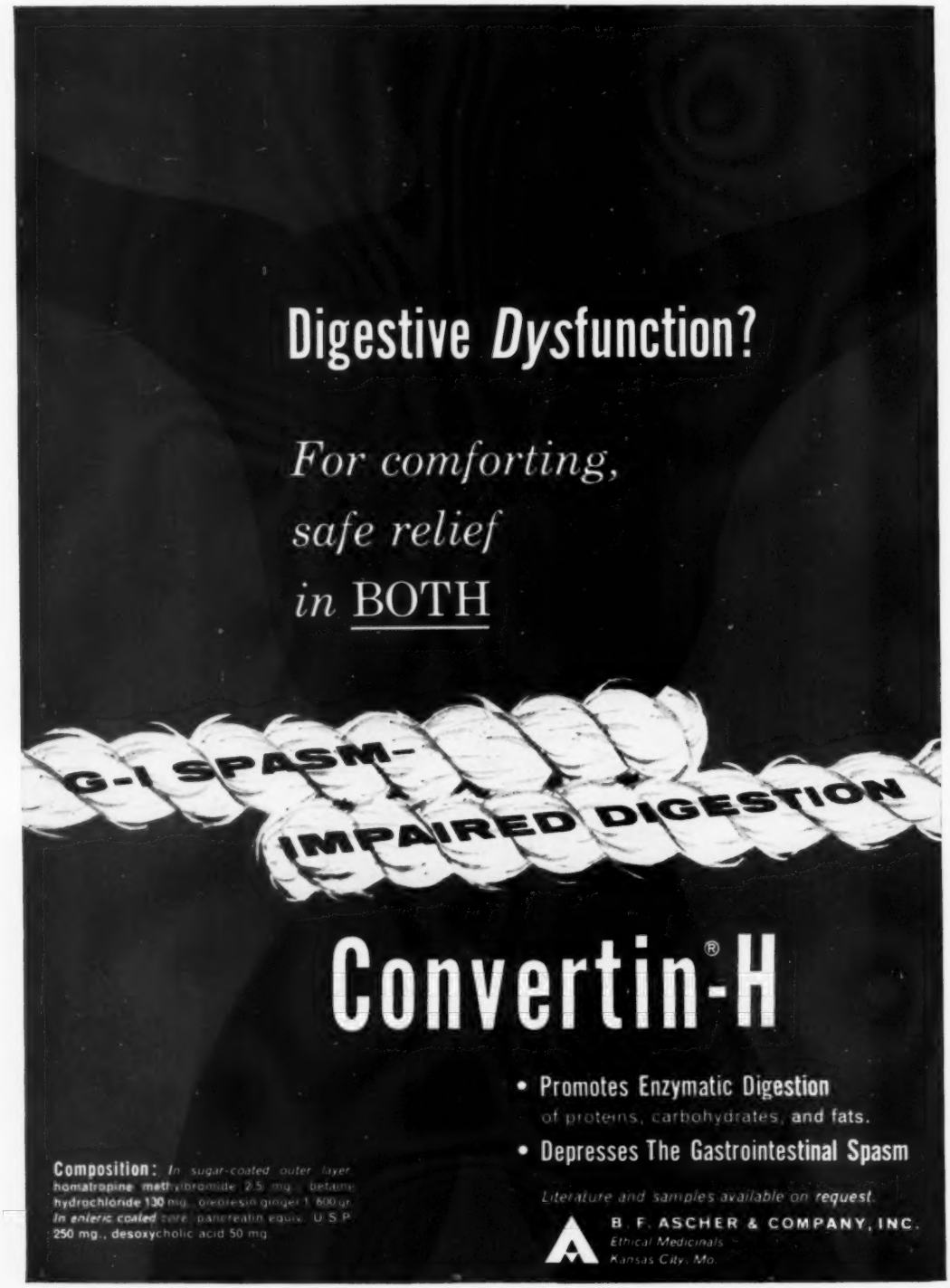
Each tablet contains: 200 mg. Miltown + 10 mg. pentaerythritol tetranitrate.

Usual dosage: 1 or 2 tablets q.i.d. *before meals* and at bedtime.
Dosage should be individualized.

For clinical supply and literature, write Dept. 20A

WALLACE LABORATORIES, *New Brunswick, N. J.*

©ML-7183 *TRADE-MARK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For comforting, safe relief in BOTH
G-I SPASM—
IMPAIRED DIGESTION
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• Promotes Enzymatic Digestion
of proteins, carbohydrates, and fats.
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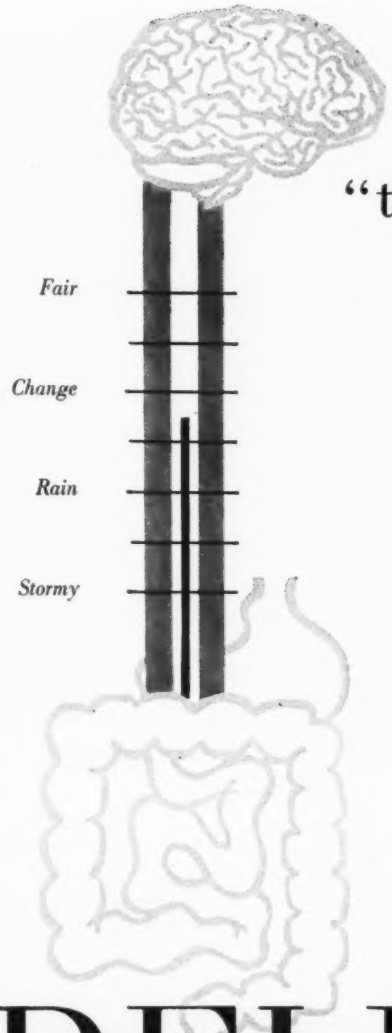
Composition: In sugar-coated outer layer, homatropine methylbromide 2.5 mg., betaine hydrochloride 130 mg., oleoresin ginger 1.800 gr. In enteric coated core, pancreatin equiv. U.S.P. 250 mg., desoxycholic acid 50 mg.



"the G-I tract is the barometer of the mind..."

Belbarb soothes the agitated mind and calms the G-I spasm through the central effect of phenobarbital and the synergistic action of fixed proportions of natural belladonna alkaloids on the gastrointestinal tract.

BELBARB

SEDATIVE ANTISPASMODIC

20 years of clinical satisfaction

Belbarb No. 1; Belbarb No. 2; Belbarb Elixir; Belbarb-B; Belbarb Trisules

CHARLES C. HASKELL *& COMPANY, Richmond, Virginia*

effectively allays tension in hypertension

Theobarb®-R

hypotensive-sedative

EACH TABLET CONTAINS:

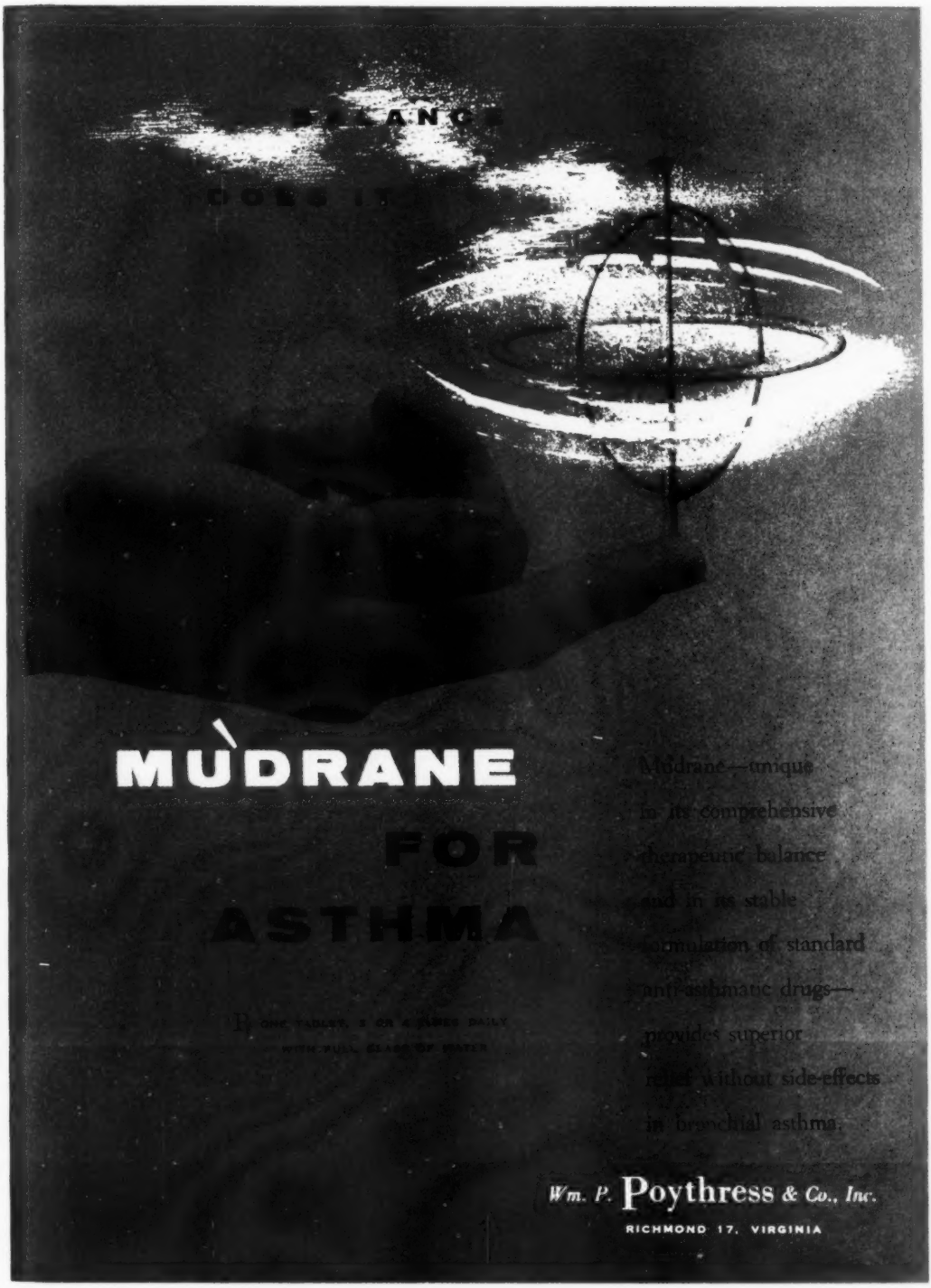
theobromine	*324 mg. (5 grains)*
phenobarbital	*10 mg. (1/6 grain)*
reserpine	*0.1 mg.*

DOSAGE: One tablet 3 or 4 times daily for the first week; thereafter, not more than 2 to 2½ tablets daily.

PACKAGED IN BOTTLES OF 50 AND 500 TABLETS

Samples and literature available on request

VANPELT & BROWN, INC., Richmond, Virginia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FOR
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Mùdrane—unique
in its comprehensive
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formulation of standard
anti-asthmatic drugs—
provides superior
relief without side-effects
in bronchial asthma.
Wm. P. Poythress & Co., Inc.
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outstanding efficacy in **skin disorders**

STEROSAN®
Hydrocortisone

Cream and Ointment (chlorquinaldol GEIGY with hydrocortisone)

The case illustrated below typifies the superior response produced by STEROSAN-Hydrocortisone. Combining potent antibacterial-antifungal action with a reliable anti-inflammatory and antipruritic effect, STEROSAN-Hydrocortisone is valuable in a wider range of infective or allergic dermatoses.

A severe infectious eczematoid dermatitis on foot of 15-year-old boy. Patient used STEROSAN-Hydrocortisone preparation 3 times a day for 23 days with a dramatic improvement as shown.*

before treatment

after treatment

*Case report and photographs through the courtesy of N. Orentreich, M.D., New York, N.Y.

STEROSAN®-Hydrocortisone (3% chlorquinaldol GEIGY with 1% hydrocortisone) Cream and Ointment. Tubes of 5 Gm. Prescription only.

GEIGY ARDSLEY, NEW YORK

Assuredly

the

lady

is

fastidious

Massengill Powder has a "clean" antiseptic fragrance. It enjoys unusual patient acceptance.

Massengill Powder is buffered to *maintain* an acid condition in the vaginal mucosa. It is more effective than vinegar and simple acid douches.

Massengill Powder has a low surface tension which enables it to penetrate into and cleanse the folds of the vaginal mucosa.

Massengill Powder solutions are easy to prepare. They are nonstaining, mildly astringent.

Massengill® powder

when recommending a vaginal douche

Indications: Massengill Powder solutions are a valuable adjunct in the management of monilia, trichomonas, staphylococcus, and streptococcus infections of the vaginal tract. Regular douching with Massengill Powder solution minimizes subjective discomfort and maintains a state of cleanliness and normal acidity without interfering with specific treatment.

Currently, mailings will be forwarded only at your request. Write for samples and literature.

THE S. E. MASSENGILL COMPANY

BRISTOL, TENNESSEE • NEW YORK • SAN FRANCISCO • KANSAS CITY

In modern feminine hygiene and therapy

massengill® powder

Massengill Powder has cosmetic elegance. Its clean, refreshing fragrance is acceptable to the most fastidious for therapeutic or routine hygienic use. Massengill Powder solutions are easily prepared, convenient to use, nonstaining. They effectively cleanse, deodorize and soothe the vaginal mucosa, while their mild astringent properties tend to decrease vaginal secretions.

CLEAN-UP AFTER ANTIBIOTICS

Following intensive antibiotic therapy, increasing numbers of female patients return complaining of vulvar pruritus or vaginitis . . . and profuse vaginal discharge.

Most of these present the classical picture of Monilia albicans, Trichomonas vaginalis or mixed infections. When these infections occur, regular use of Massengill Powder, with its pH of 3.5 to 4.5, helps restore the normal acidity of the vaginal tract. At this normal pH the growth of pathogenic organisms is inhibited and the growth of the normal vaginal flora encouraged,[1] thus reducing the barriers to specific medication.

LOW pH RETENTION

Massengill Powder is buffered to retain an acid condition. In a recent clinical observation, ambulatory patients—with an alkaline vaginal mucosa resulting from pathogens—maintained an acid vaginal mucosa of pH 3.5 for a period of 4 to 6 hours after douching with Massengill Powder; recumbent patients maintained a satisfactory acid condition up to 24 hours. Simple acid douches (vinegar or lactic acid) are quickly neutralized by an alkaline vaginal mucosa; therefore, they are somewhat unsatisfactory in maintaining the required acid pH of the vagina.[2]

LOWER SURFACE TENSION

Massengill Powder in the standard solution has a surface tension of 50 dynes/cm. as compared to that of water and simple acid solutions with 72 dynes/cm. This added property of reduced surface tension enables Massengill Powder to penetrate into and cleanse the folds of the vaginal mucosa, thus increasing the therapeutic effectiveness. Lowered surface tension makes the cell wall and cytoplasmic membrane of the infecting organism more permeable and thus more susceptible to specific therapy.[2]

SUPPLY

Massengill Powder is supplied in glass jars of the following sizes:

Small, 3 oz.
Medium, 6 oz.
Large, 16 oz.
Hospital Size, 5 lbs.

Pads of douching instructions for patient use available on request.

REFERENCES

1. Lang, W.R., Rakoff, A.E., Am. Geriatrics Soc. *1*:520 (1953).
2. Arnot, P.H., The Problem of Douching, Western Journal of Surg., Obs., and Gyn., Vol. 62, No. 2:85 (1954).

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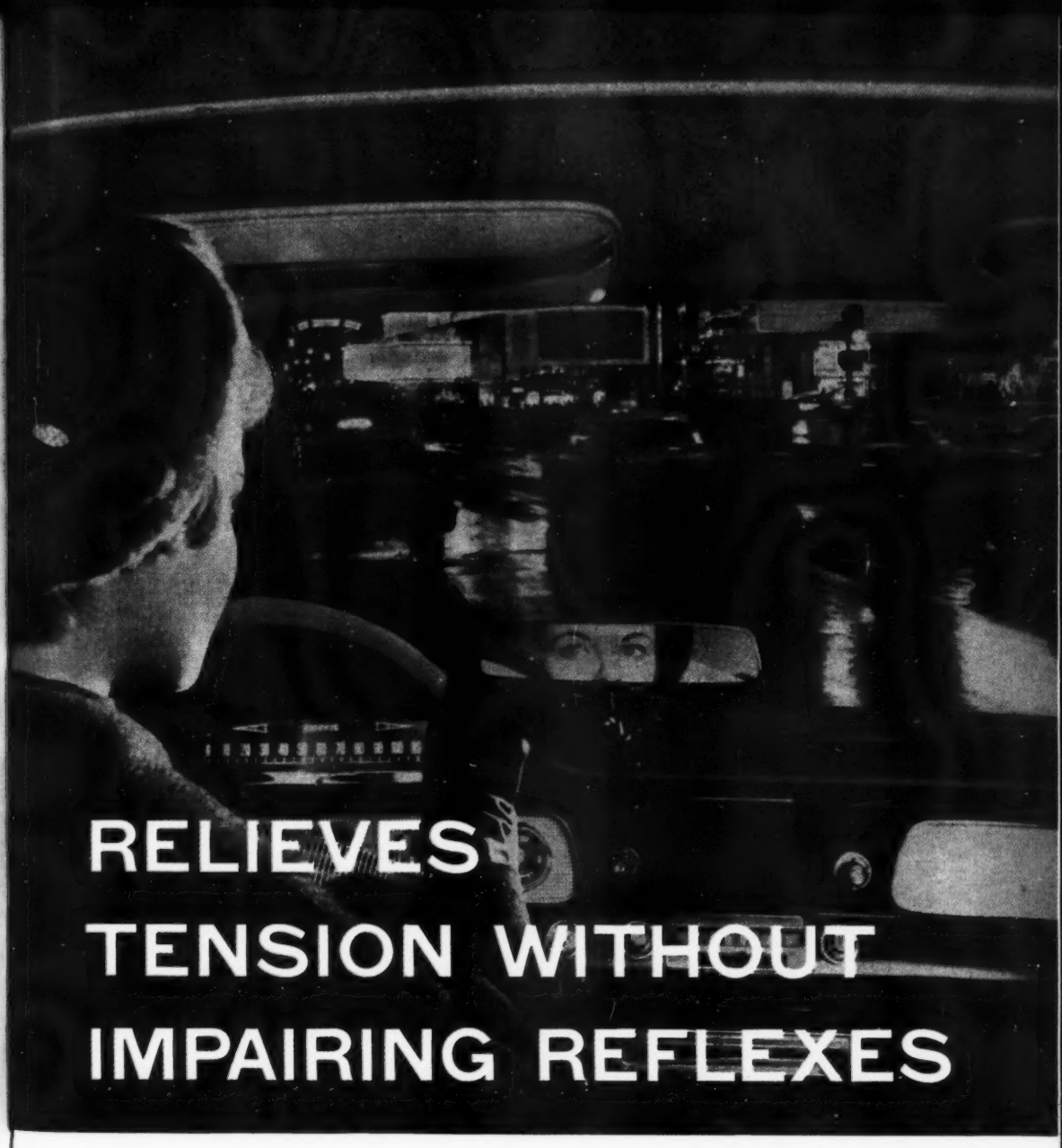

RELIEVES TENSION WITHOUT IMPAIRING REFLEXES

"Even in double the usual dosage, [Miltown] produces no behavioral toxicity in our subjects as measured by our tests of driving, steadiness, and vision."*

Relieves anxiety, tension and muscle spasm in everyday practice

- with unexcelled safety
- without impairing autonomic function

Miltown®
meprobamate (Wallace)

Usual Dosage:
One or two 400 mg. tablets t.i.d.

Supplied:
400 mg. scored tablets,
200 mg. sugar-coated tablets,
bottles of 50.

*Marquis, D. G., Kelly, E. L., Miller, J. G., Gerard, R. W. and Rapoport, A.: Ann. New York Acad. Sc. 67: 704, May 9, 1957.

WALLACE LABORATORIES, *New Brunswick, N. J.*

CM-7518

we offer **Sinaxar** STYRAMATE, ARMOUR
2-hydroxy 2-phenylethyl carbamate
AN ENTIRELY NEW CHEMICAL STRUCTURE

...unlike any other muscle relaxant currently available

- **consistently effective**
- **rapid onset of action**
- **long acting: no fleeting effects**
- **well tolerated by the G.I. tract**
- **won't cause drowsiness or dizziness**
- **produces no adverse psychic effects even on prolonged administration**
- **effective in low dosage**

Each Sinaxar tablet contains:
Styramate, Armour 200 mg.

Dosage: One or two tablets t.i.d.

THE ARMOUR LABORATORIES
A DIVISION OF ARMOUR AND COMPANY • KANKAKEE, ILLINOIS

BIFRAN®
with a
plus factor
in treating
the overweight
In addition to dulling the appetite, elevating the mood, and easing anxiety, Bifran tablets contain the plus factor, Cholan DH* (dehydrocholic acid, Maltbie). This hydrocholeretic maintains a normal flow of bile, thus avoiding the physiological consequences of low fat intake in the usual dietary program.
Prescribe Bifran tablets for your overweight patients.
Each Bifran tablet contains 5 mg. methamphetamine hydrochloride, 200 mg. dehydrocholic acid (Maltbie), and 15 mg. pentobarbital.
Supplied: Bottles of 100, 500, 1,000.
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PBN-61

Take 16 SECONDS

*to make this convincing test**

Use INCERT®

to add medication to I.V. solutions, and time the operation from start to finish. You'll find it will take just 16 SECONDS to complete the admixture . . . ready for use!

INCERT eliminates ampules, needles, syringes and all the preparation time required with the old way of "needling" solutions. Simply plug the **INCERT** vial into the large hole in the stopper of the I.V. bottle – and the job is done.

INCERT provides a sterile, safe, single-step "closed system" method of adding a variety of medications to solutions. The **INCERT** vial, left in position in the solution bottle, identifies the medication until ready for use.

Here is a real economy in lighter work-load and reduced preparation costs . . . ready for instant use in your hospital.

Sample* **INCERT *vials available for your convenience.*

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INCERT T41—Thiamine HCl 25 mg., Riboflavin 10 mg., Niacinamide 100 mg., Sodium Pantothenate 20 mg., Pyridoxine HCl 20 mg., Ascorbic Acid 500 mg.
INCERT T42—Same as above, with 1000 mg. Ascorbic Acid and Cyanocobalamin (B_{12}) 25 mcg.
VI-CERT® (Lyophilized B Vitamins with Vitamin C).
INCERT T16—500 mg. lyophilized succinylcholine chloride.
INCERT T17—1000 mg. lyophilized succinylcholine chloride.

SUCCINYLCHOLINE CHLORIDE

SUX-CERT (Lyophilized succinylcholine chloride for skeletal muscle relaxation).
INCERT T110—500 mg. in 5 cc. sterile solution.
INCERT T140—1000 mg. chloride in 10 cc. sterile solution.

POTASSIUM CHLORIDE SOLUTION

INCERT T2010—20 mEq K+ and Cl– in 10 cc. sterile solution (2 mEq/cc.).
INCERT T2030—30 mEq K+ and Cl– in 12.5 cc. sterile solution (2.2 mEq/cc.).
INCERT T2020—40 mEq K+ and Cl– in 12.5 cc. sterile solution (3.2 mEq/cc.).

POTASSIUM PHOSPHATE SOLUTION

INCERT T31—(1.579 gm. K_2HPO_4 and 1.639 gm. KH_2PO_4 per 10 cc.). Contains 30 mEq K+ and HPO_4= in 10 cc. sterile solution.

CALCIUM LEVULINATE SOLUTION

INCERT T51—10% solution, 1.0 gm. (6.5 mEq of Calcium) in 10 cc. sterile solution.

TRAVENOL LABORATORIES, INC.

Morton Grove, Illinois

pharmaceutical products division of
BAXTER LABORATORIES, INC.

UNEXCELLED ADVANTAGES . . . IN BOTH BASIC DIURETIC REGIMENS

DIAMOX*

bicarbonate-regulating diuretic

Acetazolamide Lederle

HOW DIURETICS ACT

Primarily by regulation of bicarbonate transport	DIAMOX acetazolamide
Primarily by regulation of chloride transport	mercurials chlorothiazide

1

Advantages of DIAMOX in single-drug diuresis

DIAMOX — operating through the well-understood mechanism of *bicarbonate* transport regulation—provides ample, prolonged diuresis in the great majority of patients.

DIAMOX is virtually nontoxic . . . has not caused renal or gastric irritation . . . has no pronounced effect on blood pressure. It is rapidly excreted, does not accumulate in the body, permits convenient dosage adjustment, allows unbroken sleep. Small, tasteless, easy-to-take tablets . . . usual dosage, only one a day.

- CARDIAC EDEMA
- PREMENSTRUAL TENSION
- EDEMA OF PREGNANCY
- OBESITY

2

Advantages of DIAMOX in intensive, two-drug diuresis

When intensive diuresis must be maintained, DIAMOX, alternated with an agent for regulation of *chloride* transport, has proved a regimen of choice. Through dual *bicarbonate-chloride* regulation, it produces maximal sodium-water excretion with minimal distortion of serum electrolyte patterns, greater patient comfort, lessened risk of induced drug resistance.

- ADVANCED CONGESTIVE HEART FAILURE
- REFRACTORY TOXEMIA OF PREGNANCY

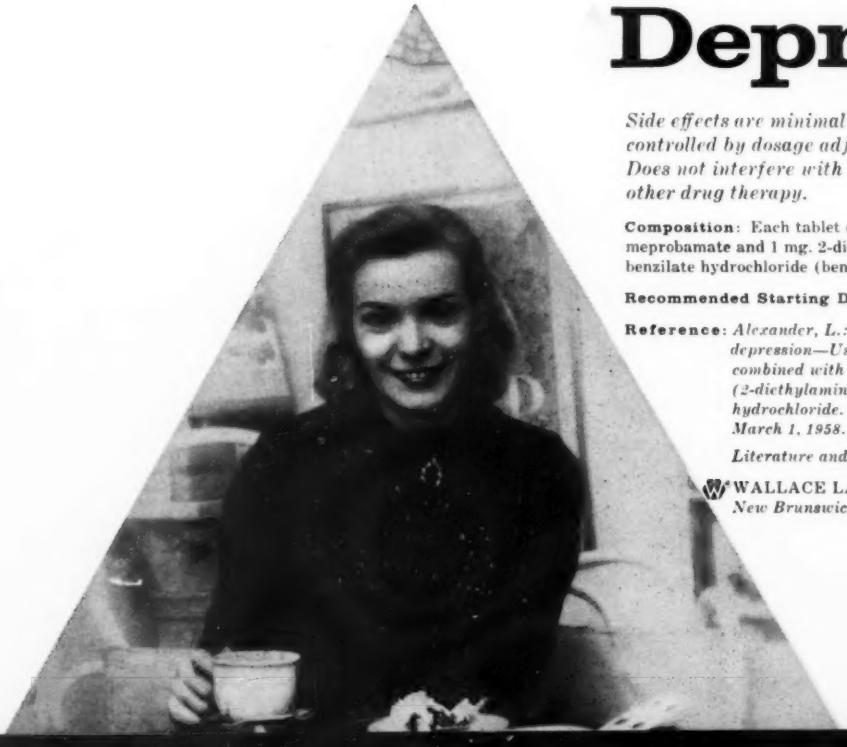
LEDERLE LABORATORIES, a Division of AMERICAN CYANAMID COMPANY, Pearl River, New York

Lederle

*Reg. U. S. Pat. Off.

NEW—
CONTROLS DEPRESSION WITHOUT STIMULATION

Relieves depression without masking it with artificial elation Restores natural sleep without depression-producing aftereffects Reduces depressive rumination Often makes electroshock therapy unnecessary Deprol acts promptly and has a simple dosage schedule. *No known liver toxicity. No effect on blood pressure, appetite. No effect on sexual function.*



Deprol†

Side effects are minimal and easily controlled by dosage adjustment. Does not interfere with other drug therapy.

Composition: Each tablet contains 400 mg. meprobamate and 1 mg. 2-diethylaminoethyl benzilate hydrochloride (benactyzine HCl).

Recommended Starting Dose: 1 tablet q.i.d.

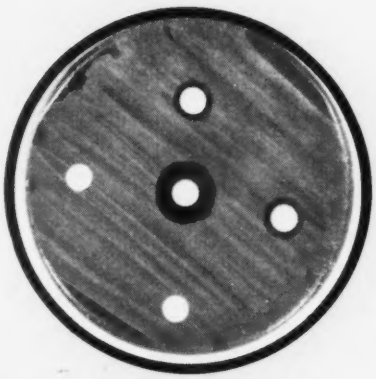
Reference: *Alexander, L.: Chemotherapy of depression—Use of meprobamate combined with benactyzine (2-diethylaminoethyl benzilate) hydrochloride. J.A.M.A. 166:1019, March 1, 1958.*

Literature and samples on request

WALLACE LABORATORIES
New Brunswick, N. J.

†TRADE MARK

on the problem of antibiotic-resistant bacteria



A POINT OF VIEW IN '55 "At this time, it appears that the problem of antibiotic-resistant bacteria is the greatest fear in the future with chronic infections of the urinary tract . . ."[1]

A POINT OF FACT IN '58 ". . . This prediction has proved to be correct for both gram-positive and gram-negative organisms."[2]

. . . WITH ONE NOTABLE EXCEPTION ". . . studies indicate that microorganisms, in vitro and in vivo, do not appear to develop resistance to FURADANTIN."[3]

for acute and chronic genitourinary tract infections

FURADANTIN®

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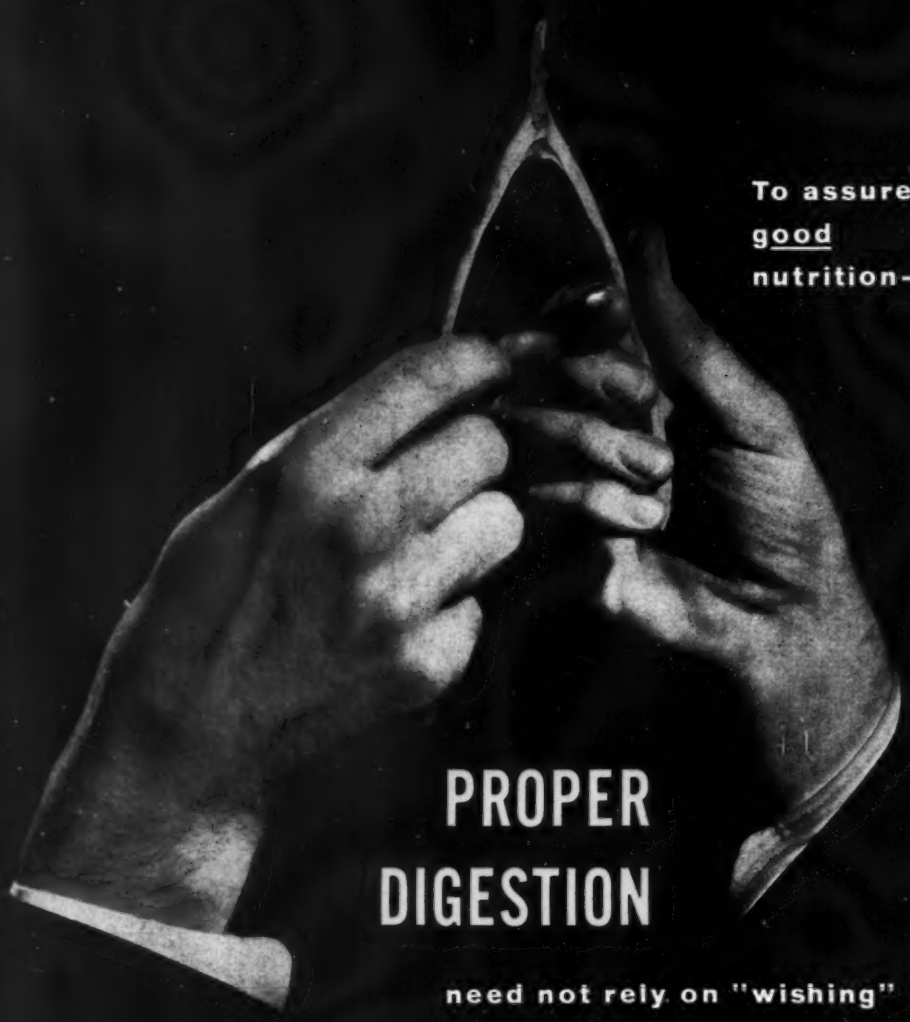

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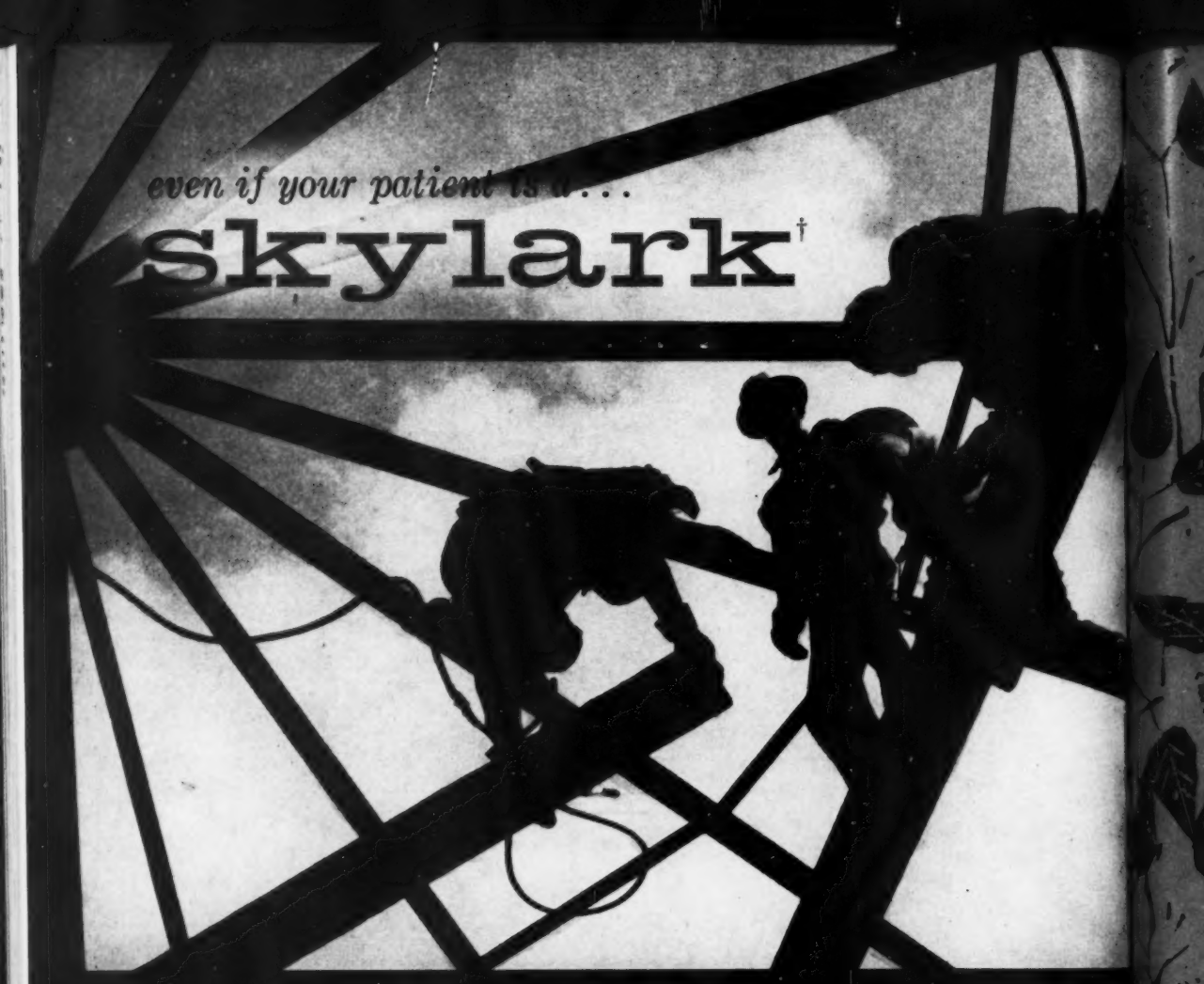

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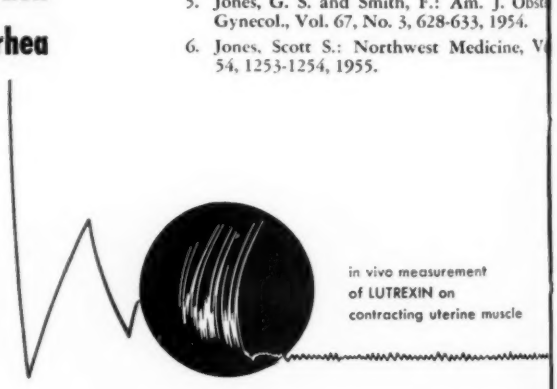

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July 1958

Sliding Esophageal Hiatus Hernia:

Manifestations, Pathophysiology, and Management. Findings in 100 Consecutive Cases*

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The several aspects of this clinical entity have been considered with special reference to diagnosis and treatment.

MODERN TECHNICS OF INVESTIGATION have within the past few years led to a new appreciation and understanding of esophageal physiology in health and dysfunction in disease. With this there has developed a widespread interest in affections of this organ. Hiatus hernia of the sliding type, the cephalad displacement of the esophagogastric junction and contiguous gastric tissue through the esophageal hiatus into the thorax, one of the more commonly encountered abnormalities, has been the subject of numerous recent writings. In our experience, this disorder has presented itself in a variety of ways. This report will review our findings in 100 consecutive cases of sliding hiatus hernia. A brief summary will consider current thought regarding pathophysiology of the terminal esophagus, leading to a discussion of management of the disease.

Classification

Several types of herniation through the esophageal hiatus may be encountered. The following outline includes these conditions.[1-4] Other varieties of diaphragmatic herniation are omitted.

1. Normal position of esophagogastric junction.
   a. Para-esophageal hernia (rolling type) is uncommon.
2. Intermittent cephalad displacement of esophagogastric junction.
   a. Concentric hernia (sliding type) is common.
   b. Eccentric hernia (sliding plus para-esophageal type) is uncommon.
3. Permanent cephalad fixation of esophagogastric junction.
   a. Hernia secondary to acquired shortening of the esophagus (relatively common).
   b. Hernia secondary to congenitally short esophagus (uncommon).

The present paper is concerned only with hernias of the sliding type.

Diagnosis

The presence of the hernia was established in each instance by means of roentgen studies. Technic employed included conventional and spot radiographs made following barium administration in the erect, recumbent, and Trendelenburg positions, assisted by Valsalva or Mueller procedures when necessary. Repeated attempts to demonstrate gastroesophageal reflux were carried out. A detailed consideration of radiologic technic is not germane to this discussion. The recent papers of Sycamore,[1] Boyd and associates,[5] and Wolf[6] provide excellent reviews of the subject.

A sliding hiatus hernia was considered

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present if the esophagogastric junction could be observed to be displaced cephalad, if the pouch above the diaphragm contained irregular mucosal folds of the gastric type, and if retrograde filling of the pouch from the stomach was demonstable (Fig. 1). Helpful accessory signs, inconstantly noted, included the finding of a broad notch on the superior portion of the hernia, gastroesophageal reflux, and abnormal width of the esophageal hiatus.

Esophagoscopy has proven adjunctive in our experience. We have failed to demonstrate any hernia by this means that had not already been disclosed by means of x-rays. The chief value of this study has been the establishment of an associated esophagitis which had been either missed or only suspected radiologically. Ideally, this examination should be performed in every case for this reason; however, such does not always prove practical.

Incidence. These 100 sliding hernias were encountered in 1,324 patients examined by upper gastrointestinal x-ray series, providing an incidence of approximately 7.5 per cent. It should be emphasized that this figure can hardly be considered representative of the population as a whole. The bulk of these 1,324 patients had symptoms referable to the upper abdomen to prompt their examinations, hence this is in no way a typical "population" study. Mobley and Christensen[7] established a minimal prevalence rate of 5 per 1,000 population in the city of Rochester, Minnesota, a figure agreeing rather closely with the findings of Lindskog and Kline[8] at New Haven, Connecticut. Apparently between 2 to 10% of individuals whose symptoms require upper gastrointestinal x-ray studies will be found to have a hiatus hernia of greater or lesser degree.[5,7-10]

Asymptomatic Hernias. It is well to point out that apparently asymptomatic sliding hernia exists.[1,3,7] Eight of our patients were found to have such a situation, with pouches measuring up to 8 cm. in diameter. Gastroesophageal reflux was observed in 3 instances. None of these 8 individuals had radiologic evidence of esophagitis or motor dysfunction.

FIG. 1

A B

A 47 year old white woman gave an 8 year history of heartburn, belching, and retrosternal pain of bending and stooping associated with nausea. (A) Erect film. Only apparent abnormality is increased width of esophageal hiatus. (B) Valsalva maneuver while in Trendelenburg hernia; hiatus hernia obvious.

Esophagoscopy was not done in this group. Even after demonstration of the hernia, careful questioning failed to disclose complaints which could in any way be construed to be due to the abnormality. In 4 of these patients, however, there was a distinct past history of heartburn, postural regurgitation, and mild dysphagia with asymptomatic intervals of as long as 14 years. It is therefore apparently possible for hernia induced distress to disappear spontaneously.

One should not conclude that the symptom-free hernia is an innocuous condition. Two additional patients, without presenting symptoms, have been followed over a 3 year period. One, a 74 year old obese woman, has consistently refused to follow medical advice, and has on 3 occasions experienced near fatal hemorrhages from associated esophagitis. There have been no warning complaints of any sort. Unfortunately, this woman has refused surgical assistance as steadfastly as she has refused medical help. The other, a man, aged 52, developed a pyogenic hepatic abscess following operation upon the biliary tract one year after an asymptomatic sliding hernia was demonstrated. Weeks of prostration in bed followed. Despite the elevation of the head of his bed, employment of a bland diet, and administration of antacids, esophagitis developed, followed by massive hemorrhage. This patient ultimately recovered without residual difficulty.

We feel that every hernia, even asymptomatic, is at least a potential source of danger and that the patient should be so apprised.

Age. Our 100 patients ranged from 26 to 84 years of age, the average age being 54.4 years. The overwhelming majority of our cases were found in the 45 to 65 age group. That the bulk of patients seen in our clinic fall within this age group partly accounts for this finding, but does not obscure the fact that the incidence of hiatus hernia steadily rises with advancing years. This truth has been amply demonstrated by others in the past.[3,7] The age at which the hernias actually developed is entirely unknown, there being no way to ascertain with certainty how long the lesions had existed. It is important to realize that younger adults may be affected (Fig. 2).

Sex. There were 68 sliding hernias found in females, 38 in males, giving roughly a 2:1 preponderance in women. This is in complete agreement with previous reports.[3,4,8]

Additional Diagnoses. Lesions coexistent with hernia were disclosed in 47 of our patients. Duodenal ulcer, the most common finding, was found in 22 individuals. Sigmoidal diverticulosis coexisted in 16. Cholelithiasis was present in 13, duodenal diverticulum in 8, pulsion epiphrenic esophageal diverticulum in 2, and gastric ulcer in 1. Seven individuals suffered from coronary artery disease with angina pectoris. Esophagitis is considered to be an integral part of the hernia syndrome and is not listed as an additional diagnosis. The existence of these various disorders made evaluation of the role played by the hernia in the production of symptoms quite difficult at times.

Symptoms

The syndrome of hiatal hernia has been thoroughly described by numerous authorities.[11-13] We feel the symptoms can be placed in 3 groups: (1) symptoms due to the hernia itself; (2) those arising from disordered esophageal motor function; and (3) those originating in an associated esophagitis. The

FIG. 2

A 26 year old white man had a one year history of progressive retrosternal and epigastric pain referred into back, dysphagia, heartburn, belching and nausea. Hernia is surmounted by a broad notch, esophageal narrowing; free reflux is present; marked esophagitis demonstrated endoscopically. Complete symptomatic relief followed surgical repair.

latter division accounts for the overwhelming preponderance of complaints. The symptom of nausea has been encountered in all 3 groups and will be commented upon separately.

Symptoms Due to Abnormal Esophageal Motor Function. Lorber and Shay[14] have observed disruption of esophageal motility by radiologic examination in a variety of states, including hiatus hernia, applying the term "esophageal dysrhythmia" to the disturbance. Esophageal emptying time was delayed; there was associated an inefficiency of normal propulsive waves to promote complete evacuation; dysrhythmic waves resembling tertiary contractions[15] were frequently noted; reflux from the distal to the more proximal esophagus was also observed. Texter and associates[3,16] employing a pressure recording device, found esophageal transport to be grossly normal in the majority of patients with hiatus hernia. Essentially normal appearing deglutition complexes were recorded, but were found to be definitely prolonged and diminished in amplitude as compared to the controls; the recordings were remarkably similar to those found in achalasia. These workers feel that the low pressure noted in the terminal esophageal segment indicates that the normal propulsive force is lacking, and that the dysphagia in patients with hernia is accounted for by the observed motility disturbance. Episodic aphagia, ascribed to a failure of coordination of the motor activity of the esophagus and cardia, was encountered in 22 of 51 patients with hiatus hernia studied by Sealy and Carver.[4]

Thirty-eight of our patients complained of dysphagia, intermittent, of mild to moderate intensity, unassociated with demonstrable esophagitic stenosis, but associated with complaints typical of esophagitis. The symptom was described as, "My food won't go through," or, "It sticks on the way down." Interestingly, none of these individuals tried to force food down with water, as is common in achalasia. Solids characteristically produced more difficulty than did liquids. The dysphagia appeared without any pattern, occurring sporadically at erratic intervals, or coming daily for a few days, to disappear for prolonged intervals. The nature of this type of dysphagia implicates but does not prove an esophageal dysrhythmia as its genesis.

Two additional patients, both men, aged 52 and 63, suffered from episodic aphagia (Fig. 3). The complaints in each were remarkably similar. At unpredictable intervals, immediately after beginning a meal, there developed a complete closure of the distal esophagus with inability to force food into the stomach. Intense epigastric pain followed, radiating on occasion into the chest, jaws, and arms. Pallor, sweating, apprehension, and tachycardia were noted. If any additional material was swallowed in an effort to open the passage, projectile regurgitation of the esophageal contents occurred. The food tasted unchanged. This frightening experience terminated a few moments later. The meal could then be resumed without difficulty. Only on rare occasions would there be an immediate recurrence of the aphagia. Sealy and Carver[4] have reported that the attacks may occasionally persist for hours. Neither of these men suffered from symptoms suggestive of esophagitis. Each had a relatively small hernia (4 to 6 cm.). Tertiary peristalsis was observed radiologically in each. (This should not be construed as conclusive evidence that tertiary

FIG. 3

A 60 year old white man gave a 2 year history episodic aphagia, without symptoms of esophagitis. Esophagoscopy was negative. Note tertiary peristalsis, esophageal diverticulum, sliding hernia. Relief with medical program, dilatations, nitroglycerine and Urecholine.

peristalsis is always associated with dysphagia.) One had a pulsion epiphrenic esophageal diverticulum. Both had negative findings upon esophagoscopy. Eight of the 12 patients examined endoscopically by Sealy and Carver[4] were found to have esophagitis.

According to Klinefelter,[17] mechanical invagination of the esophagus into the hernia is not an infrequent occurrence. This may vary from a slight prolapse to a complete intussusception. Esophagitis is apparently infrequent in this condition, but dysphagia is a common complaint.

There can be no question that peristaltic incoordination exists as an integral part of the hernia syndrome, and plays an important role in the production of symptoms.

Symptoms Due to the Hernia Itself. The emergence of a gastric pouch into the thoracic cavity may produce distress by purely mechanical means. Trapping of the hernia by the hiatal aperture with compression of the gastric tissue within the ring may give pain. Diaphragmatic spasm is often postulated but unproven. Anatomic distortion, producing traction on the right crus of the diaphragm, the left gastric artery, and the phrenoesophageal ligament, are potential sources of discomfort.

Forty-seven of our patients reported pain attributed to the mechanical effects of herniation. In 6 this comprised the sole complaint. The discomfort was appreciated in the high epigastrium or low retrosternal region and was commonly referred into the back in the region of either scapula, rarely to the suprasternal notch or arms. The description was that of "pressure," "tightness," or "fullness." Only occasionally was a burning component felt. The discomfort characteristically appeared in relation to postural changes, particularly with maneuvers increasing intra-abdominal pressure, as with bending, lifting, or straining. In addition, assumption of the recumbent position, particularly following a large meal, was apt to cause pain. Resumption of the erect posture, particularly with hyperextension of the spine, promptly afforded relief, especially if water or milk were drunk. The presence of obesity makes the hernia victim more prone to such effects.[7] Forty-three of our patients were overweight.

Dyspnea is a frequent complaint in this group. Whether this is the result of pain, mechanical compression or restriction of pulmonary tissue by the hernia, emotional, or reflex in origin cannot be stated with certainty in every instance. Dyspnea is particularly common in patients with nocturnal symptoms, making for difficulty in differentiation between hernia and cardiac disease. Pulmonary disease incident to aspiration of nocturnally regurgitated material may develop during the course of this disease,[4] but was not encountered in our series.

Free regurgitation, either nocturnal[18] or postprandial[3,4,7,8,18] after overeating is the other mechanical result of the hernia, due to disruption of the esophagocardial mechanism. This occurred in 21 individuals. An interesting variant is that of nocturnal salivation, the patient waking with his mouth overflowing with saliva and mucus. Seven patients reported this complaint.

Symptoms Due to Esophagitis. The high incidence of proven esophagitis accompanying sliding hernia has led most authorities to consider this an integral part of the hernia syndrome.[2-4,11,19-23] It is commonly said that

FIG. 4

A 64 year old housewife had a 3 year history of heartburn, belching, nausea, nocturnal regurgitation, retrosternal pain referred into back. Note sliding hernia, esophageal stenosis. There was lack of response to bougienage; she became asymptomatic postoperative.

the majority of symptoms in these patients have their origin in an associated esophagitis (Fig. 4). The reported occurrence varies from 29 to 85% in various series.[4,8,11,18-20] The inflammation may be limited to the distal esophagus, or rarely may extend proximally as high as the aortic arch.[8] As esophagoscopy with biopsy is more widely employed and more advanced radiologic technics are more generally applied, it will be possible in the not too distant future to have the exact incidence established.

In our experience, esophagitis manifests itself early as vague high epigastric dyspepsia appearing postprandially, occasionally associated with transient mild dysphagia and lower esophageal distress on swallowing. Heartburn appears later, with discomfort involving the entire food pipe on occasion. Pain, appreciated as steady, boring, and deep, may be localized to the distal esophagus or be referred more diffusely into the anterior thorax; penetration of distress into the back, particularly about either scapula is common. Intensity is usually mild to moderate; severe pain is rather uncommon. The pain develops postprandially, may be aggravated by swallowing an improperly masticated bolus, and often awakens the patient at night. Antacids usually afford relief. Regurgitation of gastric (not esophageal) contents is common. Aerophagia and belching are usual complaints. Dysphagia is often present to some extent. With persistence of the esophagitis, spasm and scarring predominate over the motor dysrhythmia and combine to make the dysphagia progressively more severe.[4,13] Complete esophageal obstruction may result. Hemorrhage varying from chronic mild blood loss, manifest as a persistent hypochromic anemia, to exsanguinating hematemesis may appear if the inflammatory process is sufficiently severe. Esophageal ulcer and perforation, relatively uncommon,[12] did not appear in our series.

The "acid-peptic" factor has been implicated in the etiology of severe esophagitis associated with hiatal hernia.[7-9,11-13,20,22,23] The fact that our patients with duodenal ulcer and hernia had more severe symptoms as a group than those without ulceration agrees with this theory (Fig. 5). Gastric analysis was done only infrequently in this series. However, an apparent correlation between hyperchlorhydria and severity of symptoms was noted, in agreement with the observations of Mobley and Christensen.[7] Peptic ulceration is encountered much more frequently among patients with esophagitis than in the population as a whole.[3,7,13,20,21] Twenty-two of our patients had both disorders. Concomitant hernia and hyperchlorhydria, particularly if associated with peptic ulceration, demand the utmost in medical control if severe complications are to be prevented.[11,13,21]

Eighty-four of our patients reported esophagitic symptoms. Complaints were mild in 41, moderate in 30, and severe in 13. X-ray evidence suggestive of esophagitis (impaired distensibility, fuzziness of outline, and narrowing) was found in 23, including all of the patients with severe symptoms, and 10 with moderate symptoms. Seventeen of these 23 individuals had esophagoscopy; redness, erosions, edema, and spasm characteristic of esophagitis was noted in each. Complete esophageal obstruction was present in 2 patients; marked difficulty in deglutition with some degree of demonstrable stenosis was experienced by 7. Two patients had massive hemorrhage. Persistent hypochromic anemia attributed to chronic bleeding was noted in 5. The size of the hernia was apparently unrelated to the severity of symptoms.

FIG. 5

A 52 year old white man with 16 years of typical ulcer distress, had 4 years of dysphagia, regurgitation, nausea, and retrosternal pain referred into back. Note esophagitis, hiatal hernia, duodenal deformity. After operation he remains on medical management because of duodenal ulcer; he had complete relief in regard to the hernia and esophagitis.

Nausea. The most frequent complaint of our patients was nausea. Ninety had this complaint to some degree; rarely was there associated emesis. The symptom was usually described as, "I get sick at my stomach," (indicating the upper epigastrium). There was no component of gagging or nausea affecting the throat. The sensation arose in association with the patients' other symptoms, but occasionally was of such degree as to overshadow all other complaints. Nausea is a nonspecific symptom; however, the fact that the overwhelming majority mentioned it indicates that it should be included as component of the hernia syndrome. The origin of the nausea is obscure; it has been recorded in patients with esophagitis, mechanical symptoms, and motor dysrhythmia. We have repeatedly observed that almost immediately following esophageal dilatation in those needing it, the patients will volunteer that the nausea was considerably improved or had disappeared. Therefore we feel that an element of circular muscle spasm in the distal esophagus must be related to this complaint.

Additional Observation. Sixteen patients have been re-studied by x-ray 1 to 3 years following the initial diagnosis. In 4 the hernia appeared larger than in the first study. Similar findings have been reported by Mobley and Christensen.[7] This tendency to enlarge should be considered in the prognosis of any given case.

Debilitating disease, senility, and prolonged confinement to bed for any reason produce markedly adverse effects due to the free gastroesophageal reflux which takes place in the recumbent position. Our 2 patients who bled, and the 2 in whom esophageal obstruction developed were in this category. We have observed esophagitic exacerbation in an additional 5 individuals following nasogastric suction subsequent to abdominal surgery. All of these factors should be considered in the long-term management of this disease.

Coexistent coronary disease and hiatus hernia make for much confusion; the pain pattern may be identical in the two diseases;[14,24-26] nitroglycerine favorably influences the discomfort from either disorder.[4,14,24,25] With the exception of exertional angina, our patients suffering from both conditions have been unable subjectively to differentiate their distress.

Pathophysiology

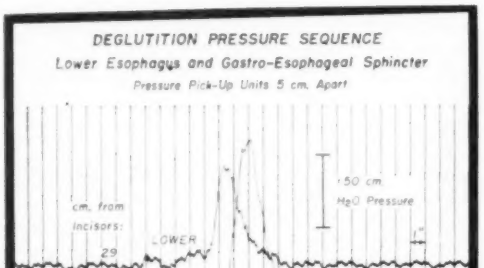
This discussion is limited to a brief summary of current thought concerning the distal esophagus as it applies to an understanding of hiatus hernia. It should be emphasized that much regarded as proven truth is only tenuous theory, that more questions exist on this subject than have been answered, and that much work is yet to be done before our ideas will be on firm ground.[27] It has been only recently that the normal motility of the lower esophagus was described. The abnormal motor function in hiatus hernia is yet to be fully investigated in the light of these findings.

The distal esophagus is anchored to the diaphragmatic hiatus by the phrenoesophageal elastic membrane which inserts into the esophageal wall some 2 to 3 cm. above the hiatus. A narrowing at this point is spoken of by some as the inferior esophageal sphincter.[28,29] Below this lies another 2 to 3 cm. of esophagus usually termed the gastroesophageal vestibule,[28,30] bounded and closed below by the constrictor cardiae according to Lerche.[28] Some workers[30-32] ascribe an entirely separate motor function to the vestibule, stating that the normal esophageal peristaltic wave does not enter this region but halts at the inferior sphincter. The work of one of us (F.E.F.) and Code[33] has shown conclusively that a segment of the extreme lower esophagus, approximately 2 cm. in length and lying at the level of the hiatus, remains tonically constricted. Relaxation of this sphincteric structure occurs within 2 seconds after swallowing while the esophageal peristaltic wave is still high in the esophagus (Fig. 6). The area remains relaxed some 8 to 10 seconds until the esophageal wave passes through in a true peristaltic fashion, to leave the sphincter again constricted.

Our work indicates that this sphincteric mechanism is a weak one, and we believe that normal positioning of the gastroesophageal junction at or below the diaphragmatic hiatus is a requisite for this to act as a competent barrier to reflux. Palmer[34] has shown this region to be subject to definite spontaneous shifting.

Although usually considered to be lined with squamous epithelium, it has been shown that the esophagus may normally be

FIG. 6



This shows the changes in deglutition pressure which occur in the lower esophagus. Designated as distance from the incisors are the positions of the pressure pick-up tubes. The voluntary swallowing act is signaled on the myograph and is actually a record of action potentials of the accessory muscles of deglutition in the neck. Noteworthy is the primary peristaltic wave moving through the lower esophagus, including the sphincteric region, and the closure of the relaxed sphincter by this wave. (This illustration was prepared by Drs. Brian Creamer and Charles F. Code, Department of Physiology, Mayo Foundation, Rochester, Minn.)

lined to a variable extent by gastric epithelium.[11,19,21] The presence of such a mucosa predisposes to the development of peptic ulcer of the esophagus as well as a severe form of esophagitis.[13] Esophageal glands, scattered the length of the organ, and cardiac glands, found in the proximal and distal esophagus, are comprised of mixed salivary secretory elements which elaborate a protective alkaline mucus which, with swallowed saliva, protect the mucosa from superficial irritation and help buffer regurgitated gastric contents.[9] Although the esophageal mucosa may be damaged by alkaline intestinal juices and bile,[9,35,36] the organ is highly sensitive to the action of acid peptic juice.[9,35,36] It should be realized that regurgitation may occur in normal individuals, and that this reflux does not necessarily produce damage.[9,27] A number of barriers to regurgitation normally exist:[4,9,12,23,27] (1) inferior esophageal sphincter; (2) constrictor cardiae; (3) mucous membrane barrier (linear esophageal folds impinging on transverse gastric folds); (4) oblique entry of esophagus into stomach; (5) flap-like valve produced by gastric air bubble; (6) sling effect of right crus of diaphragm; (7) snugging effect of phrenoesophageal ligament; and (8) tethering effect of left gastric artery.

The exact cause of sliding hernia has not been established. The possibility of a congenital defect has been raised.[3] It has also been suggested that the hernia can develop from esophageal chalasia,[1,9,27] where free gastroesophageal reflux takes place; as a result of the ensuing esophagitis, contracture of the longitudinal muscle fibers displaces the esophagogastric junction cephalad with subsequent hernia production. Severe vomiting, loss of diaphragmatic tone, obesity, pregnancy, and factors increasing intra-abdominal pressure are also incriminated.[3,4,7,12,23,37]

Whatever the cause, as the stomach migrates in and out of the hiatus, the aperture becomes enlarged and the muscular collar distorted; the phrenoesophageal ligament becomes stretched and frayed, particularly in its anterolateral aspect; a redundant peritoneal sac develops through the hiatus on the anterolateral aspect of the upper portion of the stomach and the lower esophagus; progressive impairment of the gastroesophageal barrier ensues. The right diaphragmatic crus can no longer pinch or angulate the esophagus. The esophagus appears to join the stomach at the apex of the hernia rather than obliquely. The net result is regurgitant esophagitis, disorganized function, and distress from the mechanical presence of the hernia. Contraction of longitudinal esophageal musculature assists in additional displacement of the hernia cephalad.[2-4,8,11,13,23]

Current theories do not explain all of the known facts regarding hiatus hernia and esophagitis. According to Palmer,[38] esophagitis originates in the submucosa, not the mucosa, and may be demonstrable microscopically without visible endoscopic abnormality, and can wax and wane without rhyme or reason. Reflux can exist for years without the production of symptoms or demonstrable esophagitis.[9,27] Reflux in individuals with achlorhydria may induce esophagitis.[39] "Tissue susceptibility" has to be incriminated for lack of better knowledge.

Management

Conservative therapy can effectively control the majority of patients provided severe complications have not developed prior to diag-

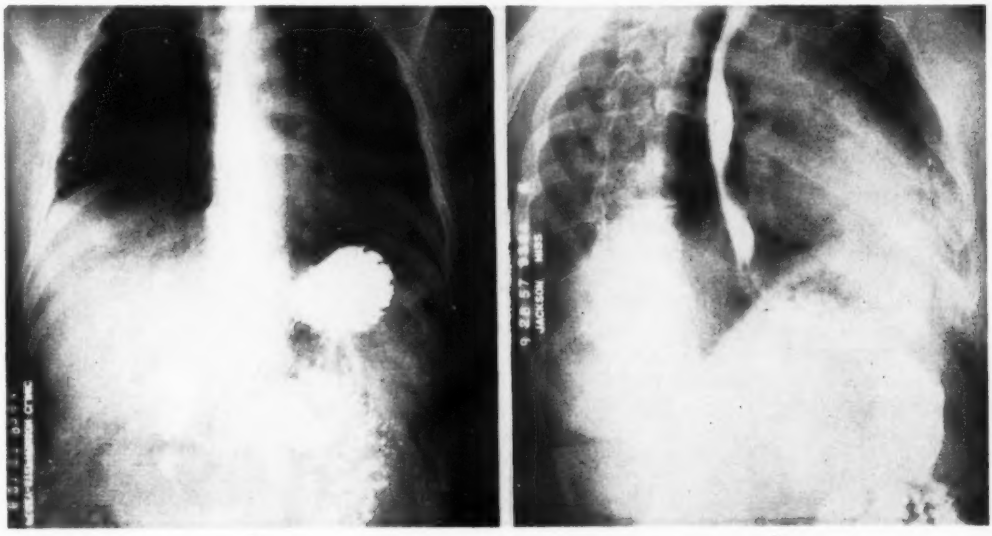
nosis, and provided the patient is willing to adhere to the necessary program indefinitely. Since he is the victim of a mechanical defect, he must be told plainly that there is no medical "cure" to be had,—only control. The only "cure" comes with surgical treatment.

The patient is advised to follow a bland, nonirritating diet, avoiding excessively hot or cold foods, and restricting the size of his meals to not overload his stomach. It is particularly wise to minimize the size of the night meal; fats, which delay gastric emptying, should not be consumed during this meal. Alcohol, coffee, and tobacco are interdicted. Anticholinergic medication is given before meals and at bedtime; antacids are administered after meals and at bedtime. Sedatives are used as indicated. Anesthetic agents, such as Novocain, given for esophagitic pain, have been of limited value in our experience. Corsets, tight belts, and confining garments are forbidden. The patient is advised not to bend, lift, or strain to avoid increasing intra-abdominal pressure. Obesity is eliminated by a rigid low calorie diet. In order to minimize nocturnal reflux, the head of the bed is elevated 8 to 10 inches. Nitroglycerine is prescribed for pain of mechanical or dysrhythmic origin.

In the presence of definite esophagitis and/or motor dysrhythmia, especially in the face of significant narrowing of the distal esophagus, dilatations afford significant relief. The Hurst bougie is adequate in most cases. Indeed, we have recently trained several patients in the use of this instrument so they may do their dilatations at home. Complete esophageal stricture is a surgical problem. It is our impression that bougienage is beneficial not only because of mechanical enlargement of the esophageal lumen, but also because it apparently assists in improving disordered motor function by some as yet unknown mechanism.

None of this series of patients has been observed for longer than three and a half years. It is therefore not safe to form any firm opinions as to the adequacy of conservatism. Seventy-nine of the patients are currently adhering more or less to a medical program and are sufficiently satisfied with their state that they have not requested surgical treatment. The 13 patients with severe esophagitis have had repair; 6 with moderate symptoms have requested repair due to unwillingness to adhere to a conservative program. Seventeen patients were completely relieved, 2 improved. No recurrence has yet appeared. In addition,

FIG. 7



A B

A 59 year old white woman had 3 years of nausea, heartburn, and epigastric pain, and 6 months of dysphagia. (A) Note hernia and narrowed esophagus. Response to dilatations was poor. (B) Following phrenic crush she was asymptomatic. Note diminution in the size of the hernia, and increased obliquity of the esophagogastric junction; no reflux was demonstrable.

2 patients have had a left phrenic crush operation (Fig. 7) with favorable results in each.

It has been our consistent experience that patients with minimal to moderate symptoms, who have been found to have sliding hiatal hernia prior to the development of severe complications, particularly those of an esophagitic nature, can easily be made comfortable by the medical approach outlined above. It is necessary to explain thoroughly the nature of the disorder to obtain the close cooperation essential to therapeutic success. In the face of a late diagnosis, coupled with advanced esophagitis, our experience indicates that relatively little benefit can be expected. Although periods of relief may follow a series of dilatations coupled with a rigid medical program, recurrence of distress within a period of days to weeks invariably follows. Our present inclination is to advise surgical repair when faced by such problems. Should there exist sufficient contraindications to an extensive operation, we feel the left phrenic crush operation should be carried out. Admittedly our experience with this is limited to 2 cases, with favorable results in each. The procedure is not commonly successful;[8,12,23] nevertheless, it offers an additional means of control where repair is unsafe.

Surgical treatment is advocated for severe mechanical symptoms, resistant esophagitis, esophageal stricture, strangulation, recurrent hemorrhage, and esophageal ulcer with perforation. Present-day surgical technics have been reviewed by Myre and associates[2] and are not pertinent to this discussion. Postoperative recurrence rates of 3 to 50% have been reported.[2]

The 2 patients with episodic aphagia have done well on conservative management. Nitroglycerine sublingually promptly relieves their occasional attacks, as it does in other hernia patients having mechanical or motor symptoms.[4,14] (Some element of smooth muscle spasm undoubtedly is present here.) Esophageal dilatations have reduced the incidence of attacks materially even though neither had esophagitis. Each has also benefited by the administration of 10 mg. Urecholine 4 times daily as advocated by Lorber and Shay.[14]

With such marked relief afforded surgically, the inability to "cure" the patient medically, and the potential danger inherent in each case, why not repair every individual with sliding hiatus hernia? Once the surgeon is able to assure us that he can give the patient a permanent cure, without any appreciable operative risk, and without any aftereffects, such may well become our policy. That day may be in the not too distant future.

Summary and Conclusions

Sliding esophageal hiatus hernia was encountered 100 times in 1,324 individuals requiring upper gastrointestinal study, the diagnosis being made by the x-ray in each instance. Esophagoscopy was a valuable adjunctive tool. The incidence increased with age. Asymptomatic hernia was present in 8%, but was demonstrated to be potentially dangerous. Additional disease was found in 47% of patients. A 22% incidence of duodenal ulcer was observed.

Symptoms of sliding hiatal hernia were classified as: (1) motor in nature (periodic dysphagia and episodic aphagia) in 40%, (2) due to the mechanical effects of the hernia (postural pain, regurgitation) in 47%, and (3) having their origin in an associated esophagitis (heartburn, pain, belching, painful swallowing, bleeding) in 84 per cent. Ninety per cent of patients had nausea of varying degrees which was occasionally of sufficient severity to be the chief complaint.

Current theories of the physiology of the distal esophagus are summarized. The pathophysiology of sliding hiatal hernia is presented.

Management may be medical (ulcer-type management, anesthetic agents, nitroglycerine, weight reduction, avoidance of factors increasing intra-abdominal pressure, elevation of the head of bed). It may be mechanical (bougienage), or surgical (left phrenic crush, repair). Episodic aphagia has responded to dilatations, Urecholine, and nitroglycerine. Results of conservative management are excellent if the diagnosis is made early, before the development of severe symptoms, but relatively poor otherwise. Symptomatic relief may be expected to follow a properly performed repair.

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Differential Diagnosis of Hirsutism*

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Hirsutism in women is a troublesome complaint and may have serious connotation. Newer methods of endocrinologic investigation offer diagnostic tools of value in some cases.

HIRSUTISM, a problem frequently encountered in the daily practice of medicine, may be defined as a quantitative increase in hair on the body without specification as to its distribution or qualitative features. A syndrome of masculinization or virilization is produced when hirsutism plus somatic alterations of a masculine type are present in a woman.

Hair may be classified as ambosexual or sexual (Fig. 1). The ambosexual form includes the hair of the scalp, eyelashes, eyebrows, and that on the arms and lower legs. Both men and women have sexual hair in the axillary and pubic areas. In addition,—a man usually has a beard; hair on his chest, shoulders, and back; in the regions of the areolae; on the dorsum of the fingers and toes; and a typical pubic escutcheon. Also, he may have auricular hair. As time passes, temporal recession of hair and, eventually, baldness may occur.

Hirsutism, alone, may be the only physical abnormality present in a woman. However, more frequently, this sign is a part of the general picture of masculinization which, for convenience, may be divided into two phases. The first phase is defeminization, characterized by diminution or cessation of menstruation, loss of feminine contour, and atrophy of the breasts, the uterus, and the ovaries. Heterosexual hirsutism, enlargement of the clitoris, and a noticeable deepening or hoarseness of the voice partially characterize the second phase, that of virilization. Skin changes such as coarsening, acne, hypertrophy of the sweat and sebaceous glands, and increased vascularity of the cheeks,—plus the late appearance of temporal hair recession and male baldness complete the syndrome.

FIG. 1

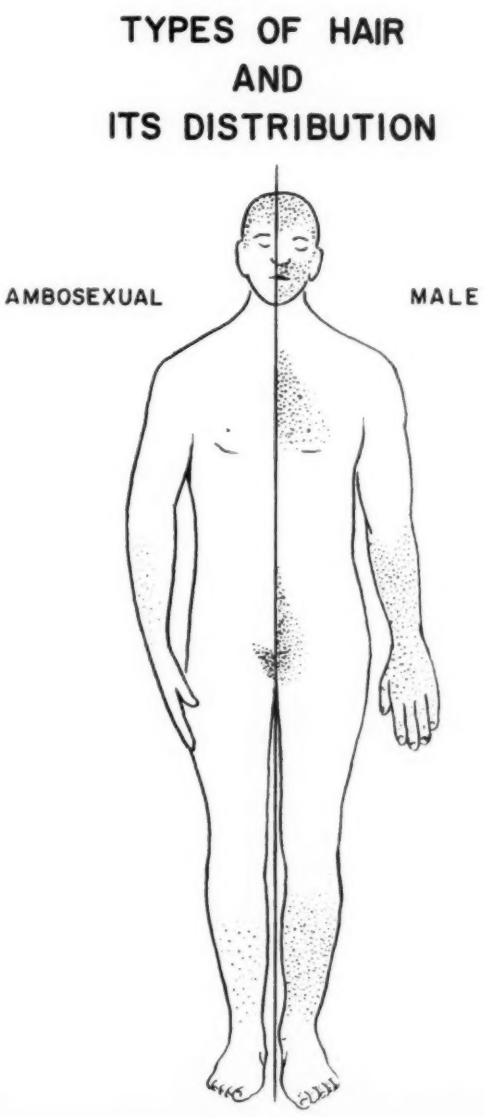

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FIG. 2

Detail of facial hirsutism in a patient with Cushing's syndrome.

Etiology

Idiopathic Hirsutism. About 30% of all women have hair of a masculine distribution in an amount considered more than normal. Usually this type of hirsutism is familial. It is common in women of the Mediterranean region, and it appears at or about the time of puberty. Initially, it is progressive, then growth becomes stationary. Generally it is unassociated with signs of defeminization or virilization, and the excretion of 17-ketosteroids in the urine in 24 hours is normal.* Kappas and associates[1] have postulated that these women have a subtle abnormality of adrenocortical function which is of a transitory nature.

Pathologic Hirsutism. The basic etiology of pathologic hirsutism may be considered due to an excessive amount or the increased production of androgenic steroids. These may be from an exogenous source, such as the oral or parenteral administration of testosterone. The adrenal glands or the ovaries constitute the endogenous sources from which these androgens may arise as a result of abnormal independent function or stimulation from the anterior pituitary gland.

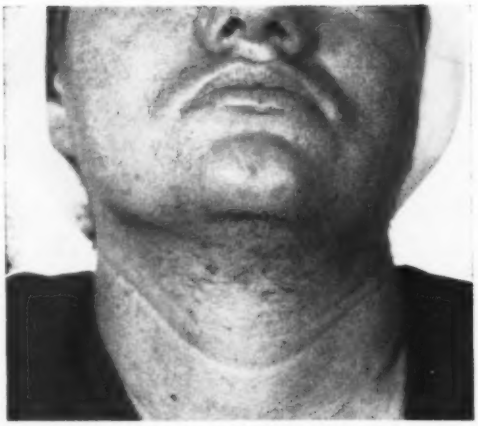
Adrenal Causes. Hyperplasia, adenoma, or carcinoma represent pathologic alterations of the adrenal glands which produce hirsutism. An abnormal growth of hair has been reported as a single abnormality indicating adrenal adenoma.[2,3] More frequently, however, the hirsutism is a conspicuous feature of the multifaceted clinical manifestations of Cushing's syndrome or of the adrenogenital syndrome.

Cushing's syndrome presents clinical findings of moon facies, buffalo hump, truncal obesity, abdominal striae, and muscular weakness (Fig. 2). The distribution of pubic hair is masculine in type; and acne of the face, neck, and upper trunk accompany facial hirsutism. Amenorrhea, or oligomenorrhea, and hypertrophy of the clitoris are present. Also, the patient will have hypertension, osteoporosis, and a mild, insulin-resistant form of diabetes. The urinary excretion of 17-ketosteroids in 24 hours will be normal or slightly increased, and the excretion of 11-oxysteroids will be increased.

Characteristically, the adrenogenital syndrome consists of facial hirsutism, plus a general increase of hair on the body and a male pubic escutcheon (Fig. 3). Excellent skeletal musculature results in a masculine configuration of the body. When combined with a deep voice, acne, amenorrhea, and clitoral hypertrophy, the picture is completed. The urinary excretion of 17-ketosteroids in 24 hours is increased, but there is no tendency to develop diabetes or hypertension. There is an increase in the elaboration of Albright's "N" hormones[4] which, through their anabolic and adrenogenic effects, result in the adreno-

*The normal laboratory value (Masuda and Thuline method) for excretion of 17-ketosteroids in the urine is 8-20 mg. per 24 hours for men and 6-15 mg. per 24 hours for women.

FIG. 3



The abnormal growth of facial hair in a patient with the adrenogenital syndrome.

genital findings. Chiefly, these are responsible for the masculinizing effect; whereas, the findings in Cushing's syndrome are manifestations of an abundance of "S" hormones (Fig. 4).

During the menopause some women show the combined effects of excessive "N" and "S" hormones, thus demonstrating the Achard-Thiers syndrome (Fig. 5). Clinically, they display facial hirsutism, obesity, and a mild form of diabetes evidenced by hyperglycemia.

Ovarian Causes. The pathologic involvement of the ovaries may be either by tumor or by hyperplasia. The excessive androgenic substances may originate from these ovaries and result in hirsutism and severe oligomenorrhea or amenorrhea. No metabolic derangements are evident, however, and the excretion of 17-ketosteroids in the urine is normal or only slightly elevated.

Rare among all ovarian tumors are the arrhenoblastomas[5] and the adrenocortical cell rest tumors.[6] Other uncommon tumors are the gynandroblastomas[7] and the hilus cell tumors.[8] Hyperplasia of the theca interna cells has been found accompanying virilization,[9] as has hyperplasia of the hilus cells.[8] These cells are morphologically identical to the Leydig cells of the testicle. The bilateral polycystic ovary syndrome of Stein-Leventhal[10] is characterized clinically by hirsutism plus obesity, amenorrhea, and sterility.

Anterior Pituitary Gland Causes. An eosinophilic adenoma of the anterior pituitary gland developing after puberty results in the characteristic picture of acromegaly; this rare condition creates hyperplasia of many tissues and organs. Adrenal hyperplasia is a frequent necropsy finding in these patients, and it was responsible for hirsutism in 53% of Cushing's cases.[11]

A basophilic adenoma of the anterior pituitary gland produces clinical findings indistinguishable from the hyperadrenocorticism of Cushing's syndrome. These symptoms and findings also result from adrenal hypertrophy.

Miscellaneous Causes. A large heterogeneous group of conditions includes hirsutism as a clinical finding; however, it is unusual among the manifestations which signify these diseases. The group includes thymic tumors with secondary adrenal hyperplasia eventuating in a Cushingoid syndrome, dermatomyositis, brain concussion, neuritides of several varieties, mumps encephalitis, mental deficiency, and multiple sclerosis.[4] Hirsutism is known to occur in the erythropoietic form of porphyria, and less frequently in the hepatic cutanea tarda and intermittent acute forms of this bizarre disease.[12] Friedman and others[13] have recorded the development of virilization during pregnancy.

Diagnosis

After a thorough case history and a comprehensive physical examination, the initial laboratory procedures should include appropriate studies to determine the metabolic

FIG. 4

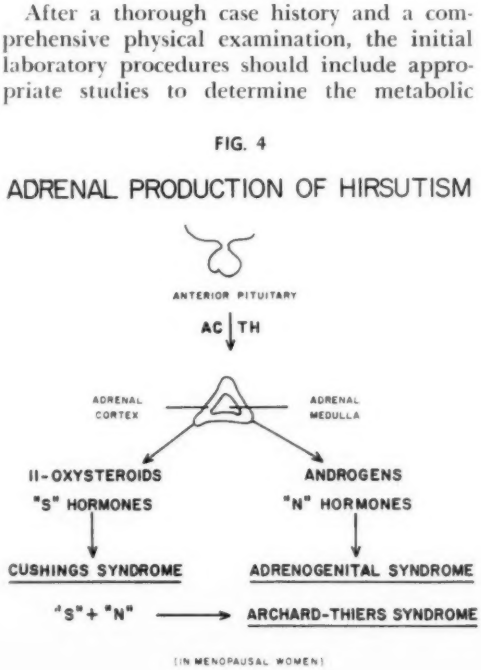
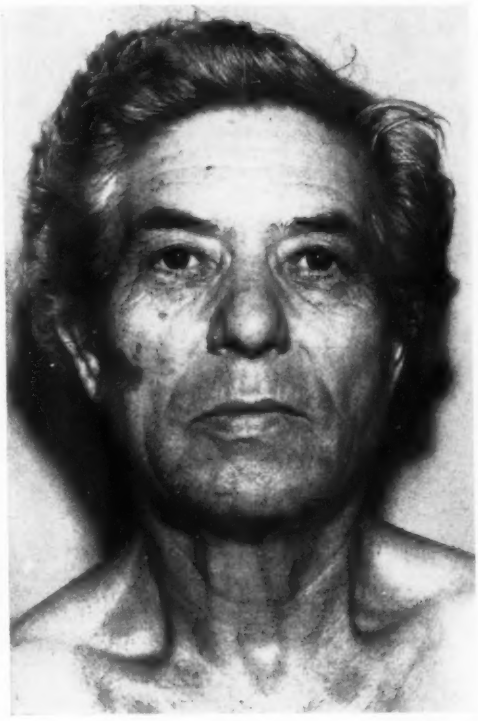


FIG. 5



Patient with Achard-Thiers syndrome. Facial hirsutism required shaving daily.

status of the patient. Excessive oxysteroids will result in diabetes, a negative nitrogen balance, and demineralization of the bones. Excessive desoxysteroids will produce retention of sodium chloride, hypertension, cardiomegaly and, eventually, edema. These metabolic derangements would not be expected to be present in the adrenogenital syndrome, but would be evident in Cushing's syndrome. In the adrenogenital syndrome the predominance of the androgenic steroids is responsible for the general picture of virilization, without the electrolytic alterations and cardiovascular symptoms that accompany Cushing's syndrome. Roentgenologic studies may be obtained simultaneously with the other investigative procedures, and these studies should include an excretory urogram. Perirenal or presacral insufflation of air may be required to delineate a suspected adrenal tumor. With rare exception an ovarian cause of hirsutism would not be expected to alter the urinary excretion of 17-ketosteroids in 24 hours. In the woman these compounds normally originate from the adrenal cortex only. A normal or slightly elevated excretion of 17-ketosteroids in 24 hours would indicate Cushing's syndrome (Table 1).[11] A moderate increase, particularly of the alpha fraction, occurs most frequently in the adrenogenital syndrome and in the presence of hyperplasia of the adrenal cortex. Very high excretion of 17-ketosteroids, 50% from the beta fraction, indicates carcinoma of the adrenal cortex.

If the adrenal gland is the suspected source of excessive androgens, the cortisone test[14] will provide more precise differentiation between an adenoma or carcinoma, and hyperplasia of the adrenal cortex. The elevated excretion of 17-ketosteroids will be depressed to levels approximating the normal for the patient's age and sex when the patient with adrenal hyperplasia is given appropriate amounts of cortisone or hydrocortisone.[15,16] Conversely, if cortisone is administered to a patient with neoplastic involvement of the adrenal glands, the elevated 17-ketosteroid excretion will not be depressed.

Segaloff and others[17] have proposed the *intravenous* infusion of compound F (hydrocortisone) as a test for differentiating hyperadrenal states. They have found only slight alterations in the excretion of 17-ketosteroid and pregnandiol chromogens in patients with adrenal tumor or with Cushing's syndrome. A fall in the excretion level of these compounds in 24 hours indicates adrenal hyperplasia.[18]

An ovarian tumor usually is detectable by careful bimanual examination of the pelvis. With the good anesthetics available today, and with the minimal risk to the patient, there should be little hesitation to offer surgical exploration as an ultimate means of diagnosing a suspected but nonpalpable ovarian tumor.

Treatment

A detailed discussion of the various methods of treatment for the adrenogenital syn-

TABLE 1

17-KETOSTEROID EXCRETION IN DISEASES OF ADRENOCORTICAL HYPERFUNCTION

Adrenocortical Pathology	*17-Ketosteroid Excretion (Approximate Range) Mg./24 Hrs.*
Cushing's syndrome (panhypercorticalism)	15-50
Adrenogenital syndrome; hyperplasia of adrenals	20-70
Adrenogenital syndrome; carcinoma of adrenal cortex	60-2100

Modified from Paschkis, Rakoff, and Cantarow.[11]

drome, especially if it involves sex differentiation in the prepuberty child, will not be attempted. When it appears as adrenal hyperplasia producing pseudohermaphroditism in the infant, this syndrome is accompanied by profound disturbances in salt and water metabolism. These metabolic derangements must be recognized early for appropriate replacement therapy will be lifesaving. In the adult cortisone will suppress the production of ACTH, thereby suppressing the hyperfunctioning adrenal cortex and retarding the excessive production of androgens.

Skoog and Adams[19] have reported the successful management of a patient with adrenal hyperplasia by employing prednisone. When a dosage of 10 mg. per day was used, suppression of the 17-ketosteroid excretion was obtained without any undesirable side effects. The excessive virilizing secretions of the adrenal glands were suppressed also when the treatment was continued over a long period of time.

An adrenal tumor demands surgical removal. Although a tumor cannot be demonstrated clinically or roentgenologically, exploration is in order if pertinent laboratory findings indicate its presence. The patient with Cushing's syndrome due to adrenal hyperplasia also should be treated surgically. The preoperative preparation of both types of patients should include cortisone[20] in appropriate amounts in the anticipation of bilateral, subtotal, or total resection of the adrenal glands.

Ovarian tumors obviously require surgical extirpation. In the event the patient has the so-called "oyster ovaries" of the Stein-Leventhal syndrome, wedge resection of the ovaries is indicated. In approximately 75% of these patients, normal menstrual function with regression of the clinical findings will follow this procedure.[21]

Irradiation of the anterior pituitary gland may be attempted for the sellar tumors, but this is rarely efficacious. Surgical treatment is in order if signs of increased intracranial pressure are present.

Patients with idiopathic hirsutism often request, and are entitled to treatment. Some will prefer bleaching dark hair to reduce its conspicuousness. For others appropriate mechanical removal, such as the application of a sharp razor, offers the simplest, surest, safest, and most available means of treatment. Many chemical preparations are on the pharmacy shelf, but these produce variable results. Electrolysis is available to those who wish to spend the long time required by an experienced operator to accomplish the desired results. Irradiation epilation is to be avoided; it is mentioned so it may be condemned.

Summary

In the woman hirsutism may be idiopathic or familial. This abnormality also may result from the excessive administration of androgenic substances, or from various pathologic conditions involving the adrenal cortex, the ovary, or the anterior pituitary gland. The clinical aspects of these conditions are reviewed, and the laboratory procedures for differential diagnosis are discussed. Appropriate therapy is recommended.

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Fundamental Research on Connective Tissue as it May Apply to the Problems of Aging and Atherosclerosis*

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The author recounts interesting studies on the part played by connective tissue in the development of atherosclerosis.

THE PROBLEMS of the aging process and one of the complications of aging, atherosclerosis, occupy a central position in research today. Unquestionably, this represents the research frontier into which medicine for the next few decades must move, for it is apparent to all of us in the practice of medicine that coronary artery disease, the result of atherosclerosis, is increasing in frequency and apparently occurring in younger and younger males at the most productive period of their lives. It is the purpose of this presentation to acquaint the practitioner of medicine with some aspects of research which appear to pertain directly to this problem.

The artery is made up of two essential elements, the smooth muscle of the media, and the connective tissue of the intima, the internal elastic lamella and the adventitia. An endothelial coat, composed of a layer of single cells, lines the inner surface of the artery. To date, neither an aging change nor an involvement by atherosclerosis has been ascribed to the smooth muscle. It appears as though both of these processes are confined to connective tissue.

Connective tissue is made up of cellular elements, i.e., fibroblasts, mast cells and histiocytes, ground substance and fibers. The fibers are of two types, an elastic type and a more rigid collagen.

The aging changes appear in certain vessels, such as the coronaries, shortly after birth, particularly in males. As aging occurs, thickening of the intima increases, a portion of the internal elastic lamella becomes replaced with collagen and a fraying and duplication of the internal lamella occurs. There is a selectivity in the site of tissue change in the coronary tree in that the left coronary is involved to a greater degree than the right. This involvement is manifested histologically by a thickening of the intima which is composed of fibroblasts, ground substance and collagen. The intima thickens in localized areas, presumably as a result of the pulsating blows of the blood stream, and becomes the nidus for an atheroma. The atheroma of atherosclerosis, which apparently begins as a result of an alteration in connective tissue, develops in time its lipid characteristics. The lipids of an atheroma have not been shown to be similar to the serum lipoproteins and, in fact, a sex difference in the distribution of lipids of an atheroma has been observed; that is, the lipid of the atheroma from the aorta of a male is made up chiefly of cholesterol while that of the female consists of cholesterol as well as other lipids, such as phospholipids and neutral fat.

Arteries have the ability to synthesize cholesterol and the rate of synthesis is influenced in part by the sex of the donor. The aorta synthesizes phospholipids; in fact, isotopic studies indicate that practically all of the phospholipids of the aorta are synthesized by the wall of the vessel. The synthesis of cholesterol and phospholipids most likely occurs in the fibroblasts. Thus, the connective tissue elements of the blood vessel appear to affect or, perhaps, to control in part the lipid features of the vessel.

Over the past four and one-half years, our laboratories have been studying connective tissue obtained by the technic of implanting a relatively inert sponge into the subcutaneous

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tissues of laboratory animals and human donors. The biopsied connective tissue is rich in lipids, particularly cholesterol; in fact, the only tissue of the body surpassing connective tissue in cholesterol concentration is the brain. The connective tissue obtained by the sponge technic has a remarkable avidity for exogenous cholesterol. Thus, connective tissue of rabbits, fed diets augmented with cholesterol, became saturated with cholesterol so that upon removal the tissue resembled an atheroma or a xanthoma. Young connective tissue, such as that found in the sponge, has a stronger attraction for cholesterol than does older connective tissue, such as that found in a blood vessel. However, prolonged exposure of the blood vessel connective tissue to an elevated level of serum cholesterol results in the accumulation of cholesterol; this is the classical laboratory technic for the induction of atherosclerosis in rabbits. The phenomenon of the incorporation of serum cholesterol by collagen fibers is influenced markedly by the simultaneous administration of estrogen.

The fact that connective tissue obtained by sponge biopsy synthesizes cholesterol at approximately the same rate as that reported for aortic tissue, suggests further that the fibroblasts of the arterial wall are responsible for the lipid synthesis. Cholesterol synthesis by the fibroblasts is influenced by certain hormones. The hormone which depresses the rate of cholesterol synthesis in connective tissue of both sexes is the hormone of pregnancy known as relaxin. In the male rat, the administration of estrogen prior to the removal of the sponge effects a significant increase in the fibroblastic synthesis of cholesterol. Thus, various portions of connective tissue are affected by the sex of the animal and by the administration of sex hormones, i.e., it is principally the fibroblasts which may be affected by a sex hormone while the collagen fibers remain unaffected. Or the sex of the animal donor may significantly influence the reactivity of the collagen fibers to cholesterol incorporation without influencing the cholesterol synthesis of the fibroblasts.

The collagen fibers appear to be affected by the aging process in a manner resembling a partial tanning process. To the physical chemist, this finding indicates that aging induces additional crosslinks between the polypeptide fibrils of collagen thereby increasing the internal strength of the fiber. We are all conscious of the fact that our vessels are altered by the aging process, and this alteration is manifested chiefly by a reduction in elasticity. It is possible that the reduction of arterial elasticity in the aging process is related to the formation of collagen in the intima, internal elastic lamella and media and, in addition, to the formation of new and stronger crosslinks between the polypeptide strands which make up collagen. Thus, as the elastic properties of the vessel decrease, areas of hemodynamic stress, such as at the site of sharply angulated vessels, could respond by the development of new connective tissue. The newly formed or young connective tissue, if it has similar properties to the young connective tissue of the sponge biopsy, would be expected to have a great attraction for lipids, particularly cholesterol.

The amount of collagen formed in the sponge implant differs with the sex of the donor; the male develops more collagen than the female. This observation has been found to be true in human connective tissue as well as that of the rat. Furthermore, the collagen produced in humans of different ages varies in the physical properties related presumably to the degree of internal crosslinking; the collagen from older males and females appears to be more tightly bound and to resist swelling caused by weak acid.

In addition, a difference has been noted in connective tissue obtained from individuals representing different ethnic derivations. The Caucasians develop more cholesterol than do the Negro, the Indian or the Eskimo.

Thus, the tissue of the blood vessel altered by aging and atherosclerosis is connective tissue. The suggestive findings presented indicate that a way has been found to isolate connective tissue for a variety of biochemical and physical chemical studies. It is hoped that through such studies, an intelligent approach can be made in the understanding and, perhaps, in the partial regulation of these two most important phases of degenerative diseases.

Definition, Diagnosis, and Management of Arteriosclerotic Heart Disease*

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Until more is known about atherogenesis, there is little real rationale in the treatment of arteriosclerosis. The control of obesity is sensible.

Definition

ACCURATE DEFINITION of terms is necessary for any discussion to be very productive. Despite the fact that it is one of the diagnoses made most frequently by internists and general practitioners, "arteriosclerotic heart disease" is a term which usually remains conveniently vague. Most would agree that it is used to refer to the cardiac manifestations of arteriosclerosis, but even this is not a very exact description. The word "cardiac" is a fairly vague term itself from the anatomic point of view, referring to the pericardium and myocardium as well as valves, coronary arteries, and other structures, and therefore it would be desirable to designate the location of the pathologic process more specifically. "Arteriosclerosis," of course, does this. It locates the *site* of the disease in the arteries, but leaves some question as to just *what* the disease is. It indicates a group of diseases which have in common little more than the fact that they involve the arterial wall. The one that characteristically involves elastic arteries, such as the coronaries and, is at least, a contributory factor in perhaps 40% of all deaths in the United States each year, is atherosclerosis.[1] "Atherosclerosis," which contains roots of Greek words meaning both soft and hard, refers to a specific disease characterized by lipid-laden lesions in the arterial wall involving the intima first and often progressing to destruction of the whole wall. These lesions may go on to ultimate fibrosis and calcification and remain essentially asymptomatic or they may serve as the basis for complications which produce acute occlusions of arteries with catastrophic results. The diagnosis of arteriosclerotic heart disease, then, means that the patient has atherosclerosis and that it involves his coronary arteries.

Diagnosis

In the case of many diseases it is possible to establish the diagnosis objectively, beyond doubt, by specific physical findings, history, or laboratory studies. Often, though, the only way a well-known pathologic entity can be recognized in life is by logical reasoning based on study of the symptoms and signs presented by the patient and an understanding of the pathologic changes involved. One considers all possible explanations and then simply eliminates those which are less likely to account for the findings when all the circumstances are considered. Such a subjective method depends largely on statistics and is referred to as clinical diagnosis. It is, at present, the only effective way to diagnose coronary artery disease.

Disease of the coronary arteries is manifest almost exclusively by evidences of impaired blood supply to the myocardium. These generally take two forms: pain, and diminished ability of the heart to function efficiently as a pump. Angina pectoris, of course, is a classic basis for the diagnosis of coronary atherosclerosis, and myocardial infarction represents the end result of the same process. Diminished efficiency of the heart as a pump is invoked to explain the signs and symptoms of cardiac decompensation, when no basis for overwork of the myocardium, such as shunts, valvular deformity, or increased peripheral resistance can be found and there is no mechanical interference with its action. The diminution in efficiency is the result of diffuse patchy fibrosis in the myocardium, really many tiny infarcts with scarring, and can be diagnosed only when other intrinsic myo-

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cardial disease seems less likely. It is often associated with atrial fibrillation which itself may be a manifestation of impaired atrial blood supply.

Not infrequently very extensive disease of the coronary arteries may exist without any clinical signs or symptoms,[2,3] and in most such cases there is no reason to suspect its presence. In some of these subjects electrocardiographic or ballistocardiographic studies may show changes which suggest myocardial ischemia. Such changes are usually nonspecific and, like those findings already discussed, must be interpreted as only indirect evidence of disease of the coronary arteries.

Once it has been concluded that the blood supply to the myocardium is impaired, it is usually easy to decide whether this is due to anemia, disorder of the coronary ostia as with aortic valvular disease or luetic aortitis, or, by exclusion, the result of intrinsic disease of the arteries themselves. At this last step we are led to the diagnosis of atherosclerosis almost by default—atherosclerosis is practically the only disease that results in extensive narrowing of the coronary arterial lumens.

There has been little, if any, progress in this type of diagnosis for a very long time. Recently, though, increased attention has been paid to atherosclerosis as a result of its relative increase in importance as infectious diseases have become less of a problem, and this has led to more vigorous efforts to find a way to diagnose the disease itself. After all, as has been implied already, the problem under discussion, though loosely referred to as heart disease, is really atherosclerosis, a disease of arteries, which may be manifest in any organ in the body. The important role played by lipids in atherogenesis has been recognized for at least 100 years, and ever since Anitschkow[4] produced arterial lesions in rabbits, in 1912, by feeding them cholesterol, the likelihood that there is some sort of predictable relation between serum lipids and atherosclerosis has been the basis for most thinking on the subject. Attempts to diagnose the disease in humans have been based on this concept, too, for the most part. In addition to the serum cholesterol level itself, the phospholipid level and the ratio between the two have been studied.[5] Gofman's[6] and Lewis'[7] studies with the ultracentrifuge, and Barr's[8] contributions with electrophoresis, have contributed much to knowledge of lipoprotein metabolism but have not made it possible yet to diagnose atherosclerosis in living patients. The serum cholesterol level still correlates with the incidence of atherosclerosis as well as anything else, but is of little value in predicting clinical manifestations of the disease in a given individual.[9] Roentgenographic methods including standard technics and special angiocardiographic studies are being investigated, and these offer some hope that it may soon be possible to localize lesions accurately in some instances.

Management

In most cases the management of atherosclerosis, or arteriosclerotic heart disease, is simply the management of the manifestations already mentioned,—congestive heart failure, angina, or sometimes only ST-T abnormalities. This approach offers very little hope for ultimate improvement and has not changed materially in years. The problem which deserves most attention is the control of atherogenesis itself, resolution of lesions already present, or, at the least, prevention of its clinical manifestations.

Attempts to prevent atherogenesis or resolve lesions already present bring us at once face to face with the fact that, though we know much about the disease and are learning more, we do not know what causes it or how to diagnose it. But we do not hesitate to treat it. There is unanimity of opinion on at least one phase in this field, and that is that atherosclerosis is associated with some form of lipid metabolic abnormality in some way or another, and the specific lipid most frequently incriminated is cholesterol. In a long-term experiment involving atherogenesis in dogs,[10] we have observed, though, that the serum concentration of phospholipid varies almost exactly with that of cholesterol when the animals are on an atherogenic regimen which involves feeding large amounts of cholesterol but not phospholipid. The obvious implication is that not only cholesterol, but also other lipids are involved in this process and that some, in this case phospholipid, are synthesized in the body. It is likely that had an easy method for determination for phospholipid been generally available during the past few years we should have found ourselves denying our atherosclerotic patients

phospholipids instead of cholesterol. As Dr. Page and his co-authors[11] put it recently, it may be that Lieberman and Burchard "have dragged a blue-green herring across the trail of investigation by concentrating too much attention on cholesterol at the expense of substances of equal or greater potential interest." This type of observation, and repeated demonstration that cholesterol can be synthesized in the body from either carbohydrate, protein, or fat, has left very few authorities who still think the amount of cholesterol ingested has anything to do with atherogenesis. Cholesterol remains the most readily measured serum lipid, and the reasonable conviction that there is some relation between serum lipids and atherosclerosis, possibly a causal one, persists as the basis for most investigation of the causes of atherogenesis. Attempts at its control continue to be aimed at modification of the serum lipids as gauged by the cholesterol level.

Most of these attempts have appeared and disappeared in the last 10 years and have been based on restrictions of various elements in the diet, especially cholesterol, total fat, animal fat, or total calories. Though each method has had its enthusiastic proponents, results over-all have been no better than equivocal. The possibility that the deficiency of some substance is at fault, rather than that some other substance is present in excess, has been considered from time to time but little if anything directly applicable to control of the human disease has come from such investigations.

Much work has been based on attempts to modify the interrelationships of the serum lipids, and for a while it seemed that perhaps the addition of phospholipids or surface active agents, such as choline and inositol, would be effective in restoring a more desirable state of affairs, but this approach, too, proved ineffective.[12]

Attention was directed to the physicochemical state of serum lipids by the demonstration of the existence of a "clearing factor" which is capable of hastening the clearing of lipemic serum and by the ultracentrifugal and electrophoretic studies already mentioned. This led to the use of agents intended to correct abnormalities detectable by these methods. Heparin and various estrogens come under this heading and study of them is continuing with some encouraging and enlightening results. They are still experimental, however, and their proper use requires extensive laboratory facilities and control.

For several years it has been known that sitosterol, the counterpart in vegetables of cholesterol in animals, is capable of lowering the serum cholesterol concentration in humans when fed without changing the diet.[13] The mechanism of its action is not clear, but is probably related to formation in the intestinal tract of a nonabsorbable complex of sitosterol and cholesterol. Sitosterol is now available commercially. During the past year or so the use of nicotinic acid has become one of the most popular methods of lowering serum cholesterol. Given in a dose of 1.0 Gm., three or four times a day, it has resulted in significantly more nearly normal levels of phospholipid and cholesterol in the blood even when the diet is unmodified.[14] Medication has to be continued for results to be sustained, but this form of treatment is now in increasing use and no serious untoward effects have appeared. The most recent agents to gain widespread attention for lowering concentration of the serum cholesterol have been the unsaturated fatty acids, and several preparations of these are on the market already. There are, of course, various theories as to the mechanism of their action, but it is not really understood. Apparently they, too, will lower lipid levels and, like sitosterol and nicotinic acid, probably do no harm.

The weakest point in the rationale behind all of these approaches to the problem is that their effectiveness is measured chiefly in terms of their ability to alter the serum cholesterol level. This is because of the assumption that a lower level will lessen the propensity for atherogenesis, and this assumption is not proved.

One very active school of clinical investigators has aimed at prevention of the complications of coronary atherosclerosis rather than control of the disease itself. Reasoning that the complication to be feared most is thrombotic occlusion of the vessel, it has advocated the indefinitely continued use of anticoagulants.[15] While this approach seems reasonable enough at a glance, it has many serious drawbacks both theoretical and practical. It is difficult to get adequate controls for the evaluation of the effects of such a

regimen and most published reports are based chiefly on subjective observations. Also, in order for continued anticoagulant therapy to be really effective, the plasma prothrombin activity must be kept at "therapeutic" levels at all times. If this cannot be achieved, there is no theoretical object in continuing the medication and, despite differences of opinion, most physicians find this a very difficult task. Adequate treatment is expensive and demanding and not without inherent danger, especially in ambulatory and car-borne people. Add to this the fact that atherosclerosis itself is frequently complicated by hemorrhages within the lesion,[16] hemorrhages which have been shown to result on occasion in hematomatous occlusion of coronary arteries and are thought by many to be the precipitating factor in most instances of thrombosis, and one ends with a set of highly conflicting data. The benefits claimed for the long-term use of anticoagulants in the management of coronary atherosclerosis have not been proved but the whole subject is being investigated actively.

Surgical correction of arteriosclerotic heart disease by poudrage, arterilization of the coronary sinus, coronary endarterectomy, implantation of extracardiac arteries into the myocardium, and other ingenious procedures has been tried and will be discussed in another paper in this symposium.

Conclusions

The term "arteriosclerotic heart disease" refers to the clinical manifestations of coronary atherosclerosis. It is a clinical diagnosis based on evidences of impaired blood supply to the myocardium—congestive heart failure, angina pectoris, and/or electrocardiographic or ballistocardiographic abnormalities — in the absence of other explanations for them. There are three basic approaches to its control. One consists simply of treating the symptoms and signs as they arise, another is aimed at the prevention of manifestations, and the third attempts to prevent atherosclerosis or resolve lesions already present. This last is the most desirable approach but as yet no means of implementing it has been devised. Currently available evidence does not justify requiring the average atherosclerotic patient to submit to any severely restrictive diet or to inconvenience himself to the extent of taking any specific medicines. In most instances the patient should be instructed to avoid obesity, and treatment otherwise should be symptomatic. If the serum cholesterol is at all elevated, the patient is unusually young, or there is a history of coronary atherosclerosis in his family, one is justified in adding nicotinic acid, sitosterol, or perhaps even unsaturated fatty acids to the regimen on the assumption that these do no harm and might do some good.

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The Surgical Approach to the Nasopharynx*

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The author describes several methods of exposing the nasopharynx for the removal of benign tumors of this area.

ANATOMICALLY, the nasopharynx is a blind chamber which lies behind the nose and above the level of the soft palate. It is continuous inferiorly with the pharynx and anteriorly with the nose through the posterior choana. Along its lateral aspects lie such important structures as the orifices of the eustachian tubes, the mandibular divisions of the fifth cranial nerves, the internal carotid arteries, and the internal jugular veins.

Physiologically, the nasopharynx is an equally important structure. It is a part of the respiratory tract. It exercises a protective function against virus and infectious diseases, the causative organisms of which gain entrance to the body through it. It controls the ventilation of the middle ear, with which it communicates via the eustachian tubes, and by compensating for changes in atmospheric pressure outside the body, it enables the middle ear to conform to these changes.

In spite of its anatomic and physiologic importance, the nasopharynx is, unfortunately, a blind area in more than the physical sense. The British otolaryngologic surgeon, C. P. Wilson,[1] has well termed it the Cinderella of the nose and throat area. Although many physicians are surprisingly ignorant concerning it, the nasopharynx is the keystone of otolaryngologic practice, and the physician who is thoroughly familiar with this area is a sound practitioner of our specialty.

Few would disagree with Wilson's[1] statement that the nasopharynx always has been, and still is, a difficult structure to examine. The difficulties, however, are not insuperable. It can be studied satisfactorily by a number of technics, including digital examination, posterior rhinoscopy, the use of the Love or Senturia retractors,[1] and nasopharyngoscopy. There is therefore no real excuse for failure to determine the presence of a disease process of nasopharyngeal origin.

None the less, as Wilson points out, the diagnosis of many pathologic processes which arise in the nasopharynx is often incorrect and is usually delayed. His corollary, however, is open to argument, that error and delay in diagnosis make no great difference because, even with the diagnosis established, the results of treatment are all too often disappointing. This is undoubtedly true of malignant disease, but, as Wilson's own results prove, it is not true of benign disease.

Indications for Surgery

The malignant variety of nasopharyngeal disease needs no discussion in this paper. Surgery is not a feasible method of treatment except when it is used, as Lambert[2] expresses it, as "the surgery of approach," that is, for the application of irradiation. This is the general opinion. As Mattick and Marchetta[3] say, only the most heroic will suggest surgery for nasopharyngeal carcinoma except for biopsy or removal of enough of the mass to permit the most efficient use of irradiation. The creation of a permanent window (fenestra) for this purpose is sometimes useful.

The so-called mixed tumors of salivary gland origin, although potentially malignant, are usually of the low-grade type and are amenable to surgery. True benign conditions of the nasopharynx include congenital anomalies, such as stenosis or atresia of the posterior choana. Benign tumors are relatively infrequent. Cysts, polyps, and fibromas are observed most often. Nasopharyngeal fibroma, which is practically always of the ju-

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venile type, is probably the most frequent of the benign growths, but it is still uncommon. The largest series on record, 114 cases, was reported by Figi and Davis[4] in 1950. In 1954, Handousa and his associates[5] reported 70 cases from Cairo, and in 1956, Tapia Acuna[6] reported the same number observed over a 6 year period in the General Hospital in Mexico City. My own personal series of 6 cases, all treated surgically, is probably typical of the usual experience in private practice.

Benign tumors of the nasopharynx are not life endangering in the sense that malignant tumors are. They never metastasize and they usually grow slowly, but they have been well described as locally destructive. As they expand they cause pressure absorption of the bone and other pathologic changes, and they may extend into any of the nasal accessory sinuses, the pterygomaxillary fossa and, eventually, the cranial cavity.

These growths must therefore be removed, and most otolaryngologists believe that surgery is the treatment of choice, though some observers, notably the Mayo Clinic personnel, prefer a combination of electrocoagulation and interstitial irradiation, which they think is best carried out through a transantral approach, with or without preliminary ligation of the external carotid.

The surgical removal of a juvenile fibroma or other benign tumor is a fairly simple procedure if it is pedunculated or semi-pedunculated or if it is actually or relatively avascular. If it is intensely vascular, as some fibromas are, operation may be extremely difficult because of hemorrhage. The fibrous components of the tumor make it difficult to pick up and clamp the individual vessels, and comparatively small vessels show no tendency to contract, as vessels of small caliber ordinarily do. The risk of possible hemorrhage, however, is not a reason for avoiding surgery. It simply means that operation must be undertaken with this risk in mind.

The risk, incidentally, extends to biopsy, which should always be performed in the hospital and sufficiently far ahead of the major operation to permit laboratory examination of the specimen.

Surgical Technics

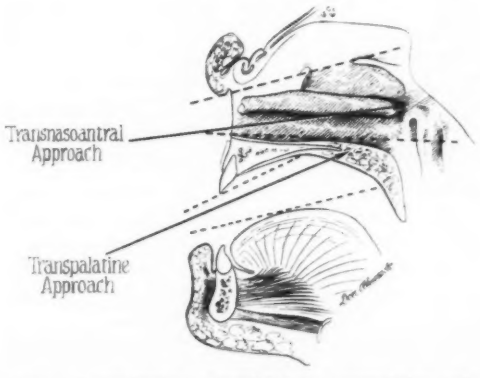
Surgery of the nasopharynx is handicapped by the anatomic consideration that this structure is conveniently accessible only anteriorly, where it is bounded by the posterior nares and the soft palate. The approach to the tumor is of the greatest importance. With adequate exposure even a difficult operation is simplified. With inadequate exposure an operation that should be simple becomes difficult.

A variety of approaches have been attempted. One of them, simple median incision of the soft palate, is not satisfactory. For one thing, the exposure is not as adequate as necessary. For another, the suture line runs through the middle of the palate, and the muscular pull exerted by the palatal structures facilitates its breakdown.

Another procedure, lateral rhinotomy, is done by splitting the lip and carrying the incision up around the nose to just below the inner canthus of the eye. This operation does not give a sufficiently satisfactory exposure to warrant the unfortunate cosmetic results.

Through the years, therefore, the transpalatine approach (Fig. 1) has evolved as the most generally satisfactory, though the satisfactory results occur only in cases in which the lesion is confined to the nasopharynx. Even benign lesions, as has just been mentioned, are not always so limited, and the transpalatine approach is not satisfactory in these cases because the necessary exposure of the nasal cavity and sinuses is prevented by the teeth and the medial plate of the pterygoid process. In these circumstances, if a complete operation is to be done, it is

FIG. 1



Areas of visualization accomplished by transpalatine and transnaso-antral (transmaxillary) approaches to nasopharynx.

necessary to use some approach to the nasopharynx which permits direct visualization of these areas.

For cases of this sort, it is best to use an operation which combines the transnasal and transantral approach (Fig. 1). Who first devised this procedure I do not know. Figi and Davis[4] described it for the application of irradiation in 1950. Wilson[1] mentions that Rouge and Halstead were using it in 1951. Kremen[7] employed it in 1953, and Marchetta and his associates[8] in 1956. It does not, however, seem to be generally known or widely used. This is unfortunate, for, as I have proved in the 4 cases in which I have employed it for tumors which had spread beyond the nasopharynx, it furnishes excellent exposure and permits total removal of the growth.

Transpalatine Operation. The transpalatine operation (Fig. 2) is performed under endotracheal anesthesia, with the patient in slight Trendelenburg position and the head and neck extended. The Davis Crowe mouth gag is used. The surgeon sits at the head of the table. Headlight illumination is essential.

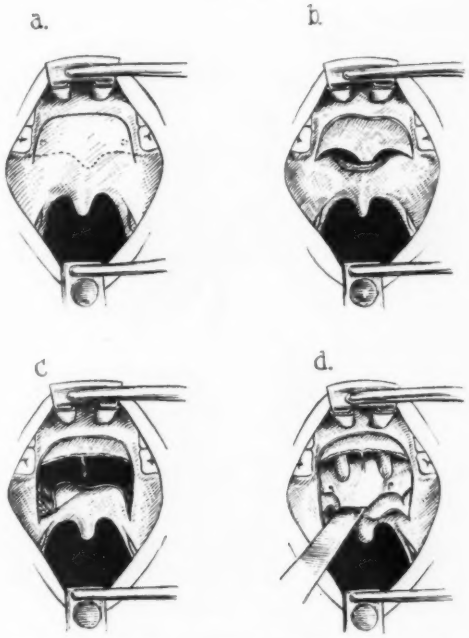
The site of the palatal incision is infiltrated with procaine and adrenalin, to aid in hemostasis. A semicircular incision, following the curve of the upper teeth, is made down to the bone across the hard palate from a point 0.5 cm. inside the upper second molar to the same point on the other side. The incision avoids the greater palatine vessels.

The U-shaped palatal flap thus created is reflected posteriorly with the Freer elevator to the posterior border of the hard palate.

The soft palate is separated from the hard palate at this point and is retracted inferiorly to expose the nasopharynx. A sufficient amount of the hard palate is then removed with the Kerrison forceps, working from posterior to anterior, to secure adequate exposure for removal of the growth present. If more extensive exposure is needed, it may be obtained by extending the original palatal incision into the pterygomandibular raphe. The medial pterygoid plate is smoothed with a cutting burr.

When this procedure has been completed, there is full visibility of the orifices of both eustachian tubes, the fossae of Rosenmuller, the posterior ends of the inferior turbinates, and the nasal septum.

FIG. 2



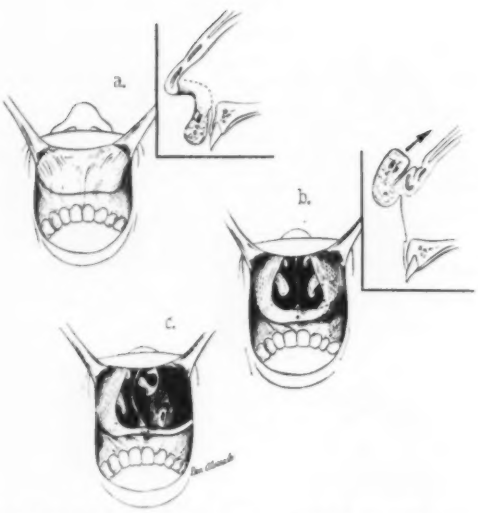
Details of transpalatine approach to nasopharynx. (a) Outline of incision. (b) Reflection of palatal flap, with exposure of hard palate. (c) Beginning resection of hard palate, to expose nasopharynx. (d) Exposure of nasopharynx after completion of resection of hard palate and retraction of soft palate.

The tumor is then removed, en masse if possible, by sharp and blunt dissection of the tumor base from its underlying attachments. Bleeding is controlled by diathermy or cauterization. Clamp and ligation technics are difficult, but clamp and cautery technics are very satisfactory.

When the procedure is concluded, the palatal flap is replaced in its original position and closure is effected with fine black silk. No pack is used.

Transnaso-antral (Transmaxillary) Operation. When the growth is unsuitable for removal by the transpalatine operation, the transnaso-antral approach (Fig. 3) is employed. Endotracheal anesthesia is used, and the patient lies in the dorsorecumbent position, with the shoulders elevated, so the head and neck can be somewhat extended. The surgeon stands to the side and uses a headlight or mirror as he prefers. As in the transpalatine operation, the site of the incision is infiltrated with procaine and adrenalin to aid in hemostasis.

FIG. 3



Details of transnaso-antral (transmaxillary) approach to nasopharynx. (a) Outline of sublabial incision. Insert shows extent of incision in cross section. (b) Retraction of lip and tip of nose to show anterior choanae, with outline of proposed resection of anterior face of maxilla. Insert shows this stage of the procedure in cross section. (c) Exposure of nasopharynx secured by transmaxillary approach.

A sublabial incision is made in the upper lip, extending across the midline from one canine fossa to the other.

The periosteum is elevated anteriorly from the anterior palatal process. The soft tissues are elevated over the premaxillary area, and a through-and-through incision is made in the septum along its caudal boundary. This incision is carried upward to the dorsum of the nose, so that the membranous columella can be retracted with the upper lip. The upper lip and the columellar portion of the nose can then be elevated over the anterior choanae. The tip of the nose can be further retracted if the septum is separated from the roof of the nose in its lower cartilaginous portion.

The anterior wall of the maxilla is then removed, as in the Denker operation. The resection is carried as far laterally and as far superiorly into the ascending process of the maxilla as the special case requires.

The antronasal party wall is next removed. The inferior turbinate is infracted and reflected upward, and, if necessary, the anterior portion of the turbinate is removed.

After the septum is reflected to the opposite side, the intranasal tissues are thoroughly shrunk with adrenalin and cocaine.

If additional exposure is needed, the posterior portion of the vomer may be removed, as well as a portion of the posterior medial antral wall and the medial plate of the pterygoid process. The surgeon must proceed cautiously when the antral wall is being removed, to protect the internal maxillary artery, which lies behind it.

Removal of the tumor is effected as in the transpalatine technic. When the operation is concluded, the surgical cavity is packed anteriorly and posteriorly with iodoform gauze or petrolatum-impregnated gauze, which is left in place for 3 or 4 days. The displaced structures are sutured into their original positions and the septal and sublabial incisions are closed with fine black silk.

Comment

The transnaso-antral technic is not intended as an improvement upon, or a substitute for, the time-tested transpalatine approach to the nasopharynx. This operation does, however, have the advantage of providing adequate exposure for the surgical removal of tumors of the nasopharynx which extend into the posterior choana or into the posterior portion of the maxillary sinus, thus making it possible for the surgeon to remove the tumor *in toto* as he works in the nasopharynx and the interior of the nasal cavity.

This approach has been criticized as being too high for work on the nasopharynx. I have not found this a drawback. It is true that the line of direction is into the posterior nasal cavity and not into the nasopharynx, but the direction is readily changed by elevating the lip and the tip of the nose (Fig. 1).

Summary

It is unfortunate that the anatomy of the nasopharynx is not well known by all physicians and that its physiologic importance is not appreciated.

This structure deserves more attention than it receives, for numerous pathologic changes may occur in it. Carcinoma is seldom suited for surgical excision, but surgery is the method of choice in the management of benign tumors.

The transpalatine operation is entirely satisfactory for growths confined to the naso-

pharynx but does not furnish adequate exposure when they have expanded beyond it. Excellent exposure is secured under these circumstances by the transnaso-antral (transmaxillary) approach.

The technics of these two procedures are outlined and their advantages and disadvantages discussed. The transmaxillary operation is supplemental to, and not a substitute for, the transpalatine technic, which is entirely satisfactory for tumors confined to the nasopharynx.

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HOTEL RESERVATION APPLICATION FORM

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APPEARS IN THIS ISSUE

MAKE YOUR RESERVATION EARLY!

Experience with a Simple Screening Test for Serotonin*

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Birmingham, Ala.

Serotonin is a most interesting substance of great physiologic importance in the body. Much is still to be learned about it and its effects.

SEROTONIN (5-hydroxytryptamine, enteramine): (a) is a potent vasoconstrictor found in the blood stream;[1-5] (b) is a principal cause of edema and vasoconstriction at a point of injury or inflammation in the tissues;[6-11] (c) is the principal mediator of contraction of smooth muscle elsewhere especially in the intestines causing normal peristalsis;[12-19] (d) in the lungs causes bronchial spasm;[2] and (e) seems to be a principal mediator of synaptic transmission of nerve impulses in the basal ganglia of the brain and the spinal cord, and apparently in the sympathetic ganglia of the peripheral nervous system.[20-27] It is not found free in appreciable amounts in the blood or tissue normally.[4,5,18] Upon injury large amounts are released in the blood from the thrombocytes during clotting, during antigen-antibody reactions such as anaphylaxis,[28-30] and in the organs and tissues from the tissue basophiles or mast cells at the site of injury. In the tissue the serotonin produces most of the edema in inflammation and the vasoconstriction both in inflammation and in thrombosis. Hereditary resistance and susceptibility to experimental syphilis, to the Brown-Pearce carcinoma, and to atherosclerosis are manifested by a variation in the hereditary levels of the blood basophiles and blood platelets.[31-40]

In the fatal bronchial spasm in anaphylaxis[28-30] or pulmonary embolism[5] the release of serotonin is suspected. Serotonin injected into heart muscle produces transient "infarction" lasting 45 minutes, and is suspected to play a part in some cardiac deaths.[5,41] Serotonin from the argentaffine cells seems to be the usual regulator of peristalsis in the intestinal and other smooth muscle tracts.[18,42-45] Overproduction of serotonin can produce diarrhea, or a spastic colon or spastic small intestine, and reduced amounts possibly ileus or megacolon. Erspamer[18] thinks the argentaffine cells of the pancreatic islets produce glucagon and those of biliary tract regulate bile flow.

Serotonin seems to be stored in large amounts in the nervous system, both peripheral and central, presumably in the ganglion cells of the basal nuclei. It is released in normal synaptic transmission and destroyed almost immediately by monoamine oxidase. There is good evidence that some psychic disorders including schizophrenia result from disturbances of serotonin metabolism. Thus, too much or too little serotonin in a few or many ganglia, or free undestroyed serotonin in the nervous system or blood, or too little monoamine oxidase could invoke a great variety of mental and peripheral nervous disorders. Thus lysergic acid and dibenamine which are serotonin antagonists induce psychiatric disorders on administration. Reserpine and other Rauwolfia alkaloids act by releasing serotonin from the nerve cells of the central nervous system. The vasoconstrictor and cardiac actions of serotonin are controlled by the drug chlorpromazine. The precursor of serotonin seems to be 5-hydroxytryptophan and a dietary deficiency of tryptophan therefore, might have protean implications in disease.

The normal degradation pathway of tryptophan has been well established only recently, even though kynurenic acid was shown in 1904 to be derived from tryptophan. The last

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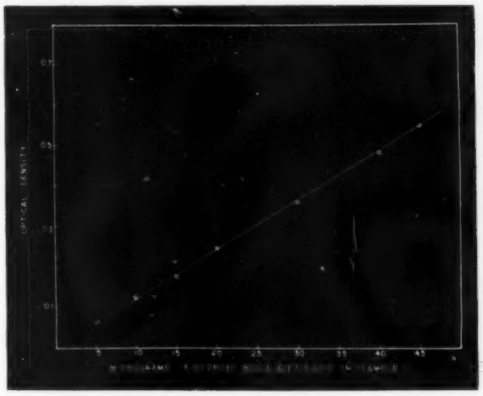
several years have seen a tremendous volume of work relating the degradation of tryptophan to the formation of nicotinic acid via the peroxidase-oxidase pathway. These and other pathways have been competently reviewed.[46-48] In a recent paper Udenfriend and co-workers[49] have proposed a scheme for the metabolism of 5-hydroxindoles which represents a significant route of the abnormal metabolism of tryptophan. This pathway is illustrated in figure 1.

In the blood as in the brain the serotonin reaches a peak in less than a minute after an antigen-antibody reaction and largely disappears within 4 minutes through the action of monoamine oxidase, which converts it into 5-hydroxyindol acetic acid. In the latter form it is stable and is excreted in the urine. It seemed possible to make a true assay of the serotonin activity in a 24 hour period through examination of single or multiple urine samples for 5-hydroxyindol acetic acid (5-HIAA). In a preliminary survey we have examined the routine specimens on some 4,500 patients for 5-HIAA with a hope of determining its variation in a broad spectrum of disease conditions.

FIG. 1

The pathway of abnormal tryptophan metabolism as reported by Udenfriend and co-workers.[57]

FIG. 2



Data illustrating the recovery of 5-HIAA using a modification of the method of Sjoerdsma.[48]

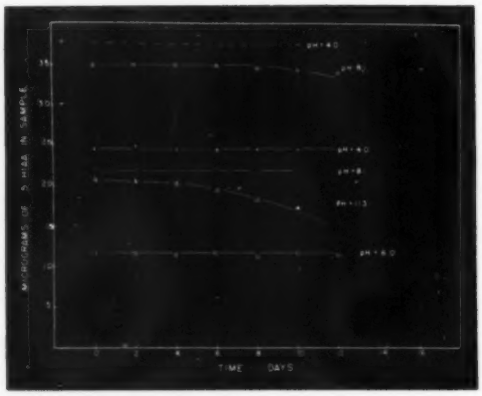
Method

Sjoerdsma and co-workers[50] reported a simple test for 5-hydroxyindol acetic acid which was slightly modified for use in our laboratory. Both Sjoerdsma[50] and Mohler[51] have indicated that the test would detect a level of excretion of the order of 40 mg. per 24 hours. By extracting the excess color reagent with ethyl acetate and spectrophotometric determination of the optical density it is possible to detect an excretion equivalent to 10 mg. per 24 hours. This is in the upper limit of the range of normal values defined by Udenfriend and co-workers,[49] Erspamer[52] and Macfarlane and co-workers.[53]

In order to demonstrate the recoveries possible using this modified technic various known amounts of 5-HIAA (Sigma Chem. Co., St. Louis, Mo.) were added to urine samples. The qualitative tests were performed in duplicate, and the optical density recorded. The data which were obtained are plotted in figure 2. It can be seen that the color reaction has a linear relation between optical density and concentration of 5-HIAA in the range of 0-40 μg. of 5-HIAA. Recoveries of known amounts of 5-HIAA can be made with a precision of 97.3-102.6% according to unpublished data obtained in our laboratory.

The stability of the serotonin metabolite in urine was studied at various pH values to determine the effect of standing at room temperature on the recovery of 5-HIAA. Various known amounts of 5-HIAA were added to

FIG. 3



Data illustrating the stability of 5-HIAA under varying conditions of pH in urine.

urine samples and the pH of the samples was adjusted using standard phosphate and borate buffers. The samples were stored at room temperature in glass stoppered bottles and the qualitative test was performed daily in duplicate on each of the samples. The optical density of the lavender color was determined using the Coleman spectrophotometer. Curves typical of the data obtained are illustrated in figure 3. It is apparent that the metabolite is stable for a period of several days within the range of pH found with urine samples. At a strongly alkaline pH (11.3) the metabolite disappears rather rapidly. This in accord with the finding of Macfarlane and associates[53] who recommend the use of glacial acetic acid and toluene in each sample to prevent alkaline decomposition.

Results

The modified qualitative test has been used to determine the 5-HIAA content of 4,517 urine samples obtained from routine admissions to the Birmingham Baptist Hospitals. Of this number there have been 43 urine samples with a concentration of 5-HIAA greater than that equivalent to a 24 hour excretion of 10 mg. This figure is based on the assumption of a 24 hour urine volume of 1,000 cc. Approximately 1% of the routine admissions have a positive qualitative test for 5-HIAA serotonin in our laboratory. The 43 patients on which positive qualitative tests were obtained may be generally grouped as shown in table 1.

Discussion

In the study by Haverback and associates[54] quantitative 24 hour determinations of serotonin were made on 70 normal and diseased subjects, other than those suffering from carcinoid syndrome. The average value for the 9 normal subjects was 4.1 mg. per 24 hours, with a range of 2.1 to 5.2. For the 70 patients, including 29 different disease conditions, the mean value was 4.4 mg. per 24 hours with a standard deviation of 2.06. The upper limit of "normal" in their series would therefore be 8.5 mg. per 24 hours. Only 4 patients had values above 8.5, namely in a case of gout 11.0 mg., in a case of lupus erythematosus disseminata with a value of 9.3 and a lymphoma with a value of 9.0. In other lupus and lymphoma cases the values were entirely normal. Since we had arbitrarily set 10 mg. as the upper

TABLE 1

43 PATIENTS WITH ABNORMALLY HIGH 5-HIAA VALUES IN ROUTINE URINE SAMPLES FROM 4,517 CONSECUTIVE GENERAL HOSPITAL PATIENTS

	Number	Per Cent
Thrombosis and Hemorrhage:		
Auto accident, trauma to nose, mouth	1	
Phlebothrombosis lower extremity, and weeping eczema of legs, arms and forearms	1	
Acute duodenal ulcer (recent phlebothromboses anus; cerebral thromboses 10 and 14 years prior)	1	
Normal delivery within 24 hours	3	
Pulmonary infarct	1	
Swelling left leg for 1 month, cancer of stomach	1	
Endometriosis peritoneum with hemorrhage	2	
Bloody, protruding hemorrhoid	1	
Hiatus hernia, vomiting blood	1	
Hemoptysis, idiopathic	1	
Fracture left hip with pain (prior cholecystectomy)	1	
Hemorrhage urinary bladder carcinoma	1	
Carcinoma of stomach with metastasis to brain	1	
	16	37%
Pain, Severe:		
Traumatic neuritis, lumbosacral; sciatica legs	8	
Ureteral colic, stone in ureter	1	
Spontaneous pneumothorax, pain and shock	1	
Anal stricture (no thromboses or hemorrhage)	1	
Acute myositis, neck (cholecystectomy 8 years prior)	1	
Acute synovitis, left hip (protruding prosthesis)	1	
	13	30%
Smooth Muscle Spasm:		
Spastic colon with diarrhea or frequent stools	3	
Diverticulosis and spasm colon (x-ray)	5	
Diverticulosis and spasm gallbladder (stones; 1 with stone in common duct)	5	
Ureteral colic, stone in ureter	1	
	14	33%
Acute Respiratory Illness:		
Upper tract (one with spastic colon)	2	
Atypical pneumonia, possibly viral (x-ray negative)	1	
	3	7%

Note: 2 patients with spastic colon also had acute sciatica and another had acute upper respiratory illness.

limit of normal for our laboratory standard, our results are in accord with those of Haverback and collaborators. They found one value above 10 mg. in a 24 hour period among 70 patients examined, and we found 43 out of 4,517 patients with a level above 10 mg., both series thus having an incidence above this level in about one per cent. They did not report cases with sciatica, thrombosis, cholelithiasis, ureteral colic or diverticulosis. Most of our positive results fell in these categories.

In our series of 4,500 patients we encountered only one patient with carcinoid. This surprisingly was a malignant carcinoid with metastasis, and the serotonin level was within normal limits, even on a second examination. This is in accord with the report by Pernow and Waldenstrom[55] who found a normal value for 5-HIAA in one out of 20 cases. Such normal values have also been suggested by Sjoerdsma,[56] who found the serotonin content of mast cells to vary from very low values in some species to very high values in others; similar variations in the serotonin content of mast cells have been reported in man.[7]

The occurrence of high serotonin values in some patients with fresh thromboses,—such as in the postpartum uterus, bleeding hemorrhoids, gastric varices, duodenal ulcer, subcutaneous trauma with hemorrhage, phlebothrombosis of the leg, hemorrhage from peritoneal endometriosis, and pulmonary infarct might have been anticipated from experimental observations that large amounts of serotonin are released from the blood platelets on clotting.[4,18]

The fundamental observations of Erspamer[18] and others that the argentaffine cells are the normal regulators of smooth muscle peristalsis in the biliary and intestinal tracts, and perhaps also in other smooth muscle systems, may be applicable to our observations that 33% of our abnormally high serotonin values were found in patients with diverticulosis and spasm of colon or gallbladder and ureteral colic. One patient with diverticulosis and spasm of the colon gave a history of nephrolithiasis 4 years before. Another had a hemorrhoidectomy 3 years before and another bleeding hemorrhoids 3 months before. Two patients with severe lumbosacral sciatica also had diverticulosis and spasm of the colon. It is conceivable that patients with abnormally high serotonin values over a period of years are the ones most likely to develop spastic colon or spastic biliary tract syndromes and perhaps increased renal and gallbladder calculi.

The occurrence of high serotonin values in patients with severe pain associated with skeletal muscle as well as with smooth muscle spasm was suggestive of the serotonin activity in the nervous system.

In 6 of the 43 patients with high qualitative values, 24 hour urine specimens were analyzed quantitatively; the values were found to range from 10 to 110 mg. per 24 hours. The ages of the 43 patients ranged from 25 to 84 years, averaging 57 years; no bias offered as to race or sex.

Summary

Among 4,517 consecutive patients in a general hospital, 43 (1%) had 5-hydroxyindol acetic acid (5-HIAA) values of over 10 mg. per 24 hours. These patients fell into 3 main categories, those with: (a) thrombosis and hemorrhage; (b) severe pain, especially sciatica and skeletal muscle spasm; and (c) spasm and diverticulosis of colon and gallbladder. Three patients had acute respiratory illness. The ages ranged from 25 to 84 years averaging 57 years; no bias as to race or sex was found.

Acknowledgment

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Endocrine Clinic

Pheochromocytoma

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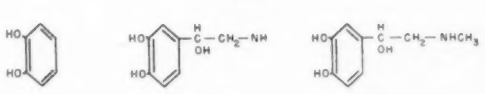
and GRANT W. LIDDLE, M.D.,† *Nashville, Tenn.*

DESCRIPTIONS OF PATIENTS with paroxysmal hypertension and adrenal medullary tumors date back to 1886, but it was not until 1922 that the relationship between the two was adequately publicized.[1] The physiologic effects of pheochromocytomas are mediated by the two catecholamines epinephrine and norepinephrine (Fig. 1). During the past 15 years a number of pharmacologic tests have been developed which involve either stimulation of catecholamine secretion or antagonism of the peripheral effects of these compounds. The recent development of chemical methods of assaying catecholamines in biologic fluids has provided a safer and more specific approach to the diagnosis of pheochromocytoma and has contributed to an increased awareness of the occurrence of these tumors.

The following case illustrates some of the salient clinical and laboratory features of this disease.

FIG. 1



The structural relationship between catechol and the catecholamines, epinephrine and norepinephrine.

Case Report*

Mrs. K.P., a 30 year old white housewife, was admitted to Vanderbilt University Hospital on September 30, 1957, as a pheochromocytoma suspect, having been referred for evaluation by Dr. W. G. Fuqua of Columbia, Tenn. Symptoms had been present for only 3 months before admission and consisted mainly of "feeling warm," "fullness" in the neck, "pounding" in the head, excessive perspiration, a feeling of tension and rapid heart beat. The complaints were more or less constantly present, but did exhibit a tendency to remit and exacerbate. Symptoms of headache, weakness and visual disturbances were specifically denied.

Each of the patient's three pregnancies (7, 8 and 9 years prior to admission) had been accompanied by transitory prepartum hypertension of undocumented degree. There was no history of a familial incidence of the patient's symptoms.

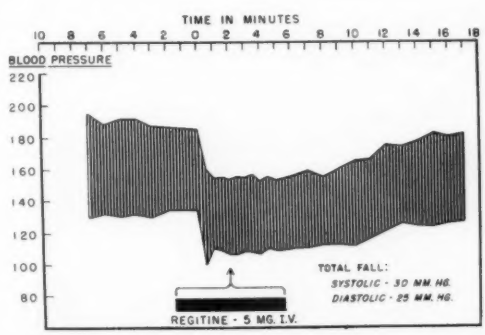
The patient was a thin, hyperkinetic woman with a basal blood pressure of 210/140 mm. Hg. and a pulse of 120. The thyroid gland was barely palpable. No abdominal masses were palpated and no other physical findings of diagnostic significance were noted. Routine blood counts and urinalyses revealed no abnormalities. Blood chemical determinations disclosed a normal electrolyte pattern, a fasting blood sugar of 118 mg. per 100 cc. and a serum protein bound iodine value of 6.1 micrograms per 100 cc. The basal metabolic rate was +31% (a BMR of +55% had been recorded by the referring physician).

The chest, gastrointestinal tract, and urinary tract were radiographically normal. The EKG showed minimal S-T and T wave depression over the left precordium.

The results of intravenous Regitine (phentolamine hydrochloride) and Benodaine (benzodioxane hydrochloride) tests (Figs. 2 and 3) were interpreted as being suggestive of the presence of a pheochromocytoma.

Urinary catecholamine values were as follow:

FIG. 2



Results of Regitine test.

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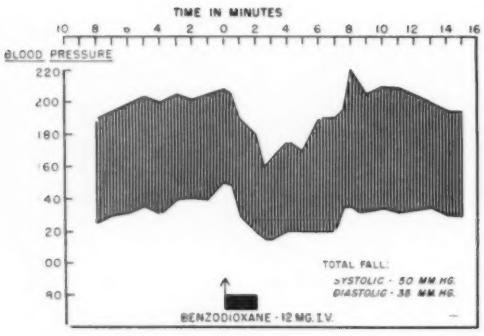
*Permission to report this case of pheochromocytoma was kindly granted by her physicians, Dr. Thomas Frist and Dr. Douglas H. Riddell, Nashville, Tenn.

FIG. 3



Results of Benodaine test.

Day	*Catecholamines (μg/24 hours)*
October 2, 1957	370
October 3, 1957	760
October 4, 1957	310
October 5, 1957	380 (97 μg epinephrine) (283 μg norepinephrine)
October 6, 1957	410
October 7, 1957	500

(Normal values are less than 150 μg/24 hours)

The diagnosis of pheochromocytoma was formulated on the following points:

(a) Hypertension without any indication of primary vascular or renal disease.

(b) Hypermetabolism without laboratory evidence of hyperthyroidism.

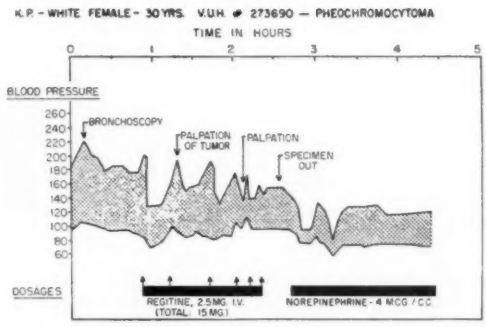
(c) Regitine and Benodaine tests which suggested the presence of high levels of circulating catecholamines.

(d) Abnormally elevated urinary catecholamine excretion rates.

Abdominal exploration was performed on October 16, 1957, under nitrous oxide and ethyl ether anesthesia. A preliminary horizontal right rectus splitting incision was extended into the left thorax by way of the ninth intercostal space after palpatory identification of the tumor in the left adrenal area. Excision was accomplished with only one untoward incident, that being a tear in the splenic capsule necessitating splenectomy. Fifteen mg. of Regitine in 6 divided doses of 2.5 mg. were given intravenously during the course of the operation to control excessive elevations of blood pressure occasioned by manipulation of the tumor. Support of the blood pressure by norepinephrine was required, however, once the tumor had been removed and was necessary for the first 20 postoperative hours (Fig. 4). On the 5th postoperative day, the blood pressure spontaneously rose to 170/115. The blood pressure then gradually declined to reach levels of 130/90-100 by the 9th postoperative day. The patient's convalescence was otherwise uncomplicated.

The basal metabolic rate on the 8th postoperative day was +8%, while determinations of excretion rates of urinary catecholamine on two occasions revealed normal values of 80 μg/24 hours and 62 μg/24 hours. Six months after removal of the tumor the patient's

FIG. 4



Anesthesia record showing the fluctuations in blood pressure during operation and the response to Regitine and norepinephrine.

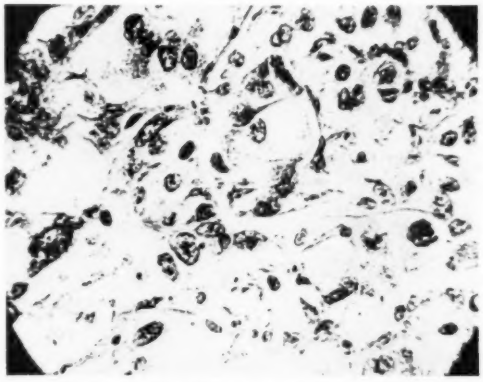
blood pressure was found to be 150/96, and her urinary catecholamine excretion was 60 μg/24 hours.

The tumor was a well encapsulated mass measuring 4 by 3 by 2 cm., weighing 29.6 Gm., and composed of soft pinkish-gray homogeneous tissue. The microscopic picture was characterized by extreme pleomorphism of the cells, mitotic figures and nuclear hyperchromatism. There was no blood vessel or capsular invasion. The diagnosis was pheochromocytoma (Fig. 5).

Discussion

Pheochromocytomas which are pharmacologically active secrete the two pressor amines epinephrine and norepinephrine in proportions which vary from tumor to tumor. Table 1 lists the important actions of the two pressor amines in man.[2] In general, epinephrine is a metabolic stimulant, while norepinephrine is a vasoconstrictor.

FIG. 5



Photomicrograph (X 641) of pheochromocytoma showing large polygonal cells with granular cytoplasm, mitotic figures and pleomorphism—a microscopic picture that might indicate malignancy in most other tumors.

Patients in whom epinephrine secretion is very excessive often present a picture simulating acute anxiety reactions or thyrotoxicosis, while those in whom norepinephrine secretion is increased may manifest a syndrome simulating essential hypertension.[3] In many pheochromocytoma patients there is augmented production of both hormones and a mixed symptom complex results.

Tumors producing predominantly norepinephrine may arise either in adrenal or extra-adrenal locations, but those producing large quantities of epinephrine have been reported to occur only in the adrenal areas.

The size of the tumor bears little relation to the severity or duration of symptoms. The usual weight is from one to seventy-five grams. The tumors may be found wherever chromaffin tissue exists, but they are largely adrenal in origin (90%) and right-sided in location (60%). Malignant lesions are found in 3 to 5% of the patients and bilateral tumors in about 8 per cent. The microscopic appearance is usually characterized by much pleomorphism and mitotic activity, and malignancy can only be judged by the presence of distant metastases in areas where chromaffin tissue is not normally found.

The physical examination is generally nonspecific except for documentation of either paroxysmal or persistent hypertension. A palpable abdominal mass is rarely found. However, occasionally abdominal palpation may initiate a rise in blood pressure.

TABLE 1

Activity	*Epinephrine*	*Norepinephrine*
Heart rate	+	—
Arrhythmias	++++	++
Systolic arterial pressure	+++	+++
Mean arterial pressure	+	++
Diastolic arterial pressure	+, 0, —	++
Total peripheral resistance	—	++
Cardiac output	+++	0
Cerebral blood flow	+	0,—
Cutaneous blood flow	— —	+, 0, —
Oxygen consumption	++	0
Blood sugar	+++	0, +
Eosinopenia	+	0
Subjective sensations of nervousness, weakness	++	0
Sweat secretion	++	0

Modified from Goodman and Gilman. The Pharmacological Basis of Therapeutics 1955.[2]
+ = increase
— = decrease
0 = no effect

Although no age group is immune to this disease, the greatest incidence is from 20 to 50 years of age. Any individual developing "essential" hypertension before the age of 40 should be screened for the presence of a pheochromocytoma.

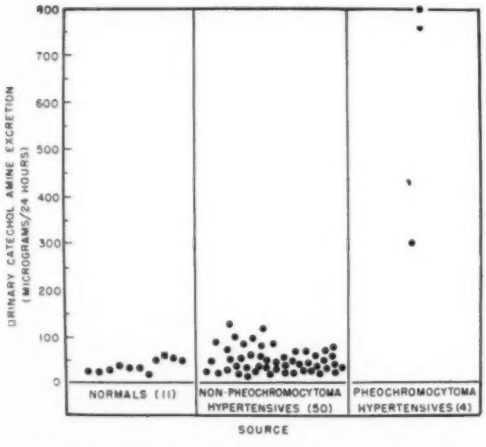
Until recently, when methods of direct estimation of blood and urine catecholamine content became practical, substantiation of the clinical impression of pheochromocytoma was dependent upon indirect pharmacologic evidence. In patients with paroxysmal symptoms, artificial elevation of the circulating pressor amines might reproduce a typical attack and confirm the diagnosis. This approach was first described by Roth and Kvale[4] in 1945 with the formulation of the histamine provocative test. If the basal blood pressure was less than 170/110 mg. Hg. a standard dose of histamine (0.05 mg. of histamine base in 0.5 cc. of normal saline) was given intravenously. A positive response was characterized by a fall in blood pressure for the first thirty seconds of the post-injection period followed by a rapid rise in blood pressure. In "positive" tests the elevation of blood pressure in response to histamine exceeded the response to the cold pressor test or exceeded the basal value by 60/40 mm. Hg. The dangers of the promiscuous use of the histamine test have been well documented.

The alternative pharmacologic procedure, inhibition of the effects of circulating pressor amines, is useful in patients presenting persistent hypertension of such degree as to interdict the use of the histamine test. Competition for receptor end organs is thought to be the basis for the inhibition of pressor amine activity. Regitine and Benodaine are the two compounds most widely employed. Regitine in the amount of 5 mg. is injected intravenously and the blood pressure response is charted every 30 seconds until the pre-test level is reached. The test is considered positive if the blood pressure falls at least 35/25 mm. Hg. within two minutes of administration of the test dose of Regitine.[5] Benodaine, 10 mg. per square meter of body surface, is given intravenously over a two minute period, and will promptly depress systolic and diastolic blood pressure for 10 to 15 minutes if the pre-test hypertension is the result of excess circulating pressor amine. A minimum fall of 30/20 mm. Hg. should be noted in an

unequivocally "positive" test. Regitine, as a rule, generates fewer undesirable side effects and is the screening procedure of choice when hypertension is present. However, false positive Regitine tests do occur and should be confirmed by means of the more specific benzodioxane test. Sedatives, narcotics and antihypertensive agents should be withheld for at least 48 hours before the performance of an inhibition test, as false positive reactions may ensue. Uremia is associated with a high incidence of false positive tests.

Von Euler and Floding[6] have described a practical fluorometric method for estimating both epinephrine and norepinephrine in the urine. As the urinary catecholamine content reflects blood levels of these compounds, an indirect evaluation of circulating pressor amine is possible. The measurement of urinary catecholamine content is at present the safest and most accurate diagnostic aid that can be employed when screening pheochromocytoma suspects. The determination of 24 hour urinary catecholamine excretion, using a modification of the method cited, of normal individuals, nonpheochromocytoma hypertensiveness and pheochromocytoma hypertensives has provided the data illustrated in figure 6. A catecholamine excretion rate of 150 micrograms or less per 24 hours is regarded as normal, while a value over 200 micrograms per 24 hours (preferably over 400 micrograms/24 hours) is considered indicative of the presence of a pheochromocytoma.

FIG. 6



Urinary catecholamine excretion values of normal adults, patients with hypertension, and patients with pheochromocytomas.

The differential diagnosis in the present case included pheochromocytoma, hyperthyroidism, and essential hypertension. Hyperthyroidism was ruled out by virtue of the normal serum protein bound iodine, normal cholesterol, and lack of confirmatory physical findings. The existence of hypermetabolism, lability of the hypertension, and the short but intense course of the symptoms suggested that this was more than essential hypertension. The abnormally high urinary catecholamine excretion rate and the suggestive Regitine and benzodioxane tests supported the clinical impression of pheochromocytoma.

Pheochromocytomas are notoriously treacherous tumors, and patients in whom the diagnosis is strongly suspected on the basis of the clinical and laboratory criteria described above should be brought to operation without undue delay.[7] Surgical treatment should be guided by the principles of adequate exposure, gentle dissection, and thorough exploration for multiple tumors. Anesthesia should be such as to permit maximal oxygenation and relaxation of the patient with minimal vasomotor instability. Blood pressure regulating drugs should be readily available to combat excesses of hypertension or of hypotension which may attend operative manipulation of the tumor.

Summary

A patient with a pheochromocytoma giving rise to hypertension and hypermetabolism has been presented. The diagnosis was confirmed by assays of urinary catecholamine excretion rates after pharmacologic tests yielded inconclusive results. Surgical removal of the tumor resulted in clinical and chemical cure.

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Epiphyseal Fractures of the Lower Extremity*

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Experimental studies show that bony fusion may occur across the epiphyseal line in fractures of this structure.

FRACTURES involving the epiphyseal growth plates of the long bones comprise a small but important group of childhood injuries. Because of the danger and significance of shortening and deformity in the lower extremity, epiphyseal injuries in this region are of particular concern. Areas most commonly involved in the lower extremity are the distal tibia, distal femur, and proximal tibia in order of decreasing frequency. Slipping of the proximal femoral epiphysis is not included in this group of injuries. When the clinician is confronted with fractures in these areas, the question of possible future growth disturbance arises. Usually an immediate answer cannot be given, for the degree of damage to the growing cartilage cells cannot often be determined by x-ray examination. The damage to the epiphyseal cartilage plate is determined by the amount of force exerted upon it and the direction taken by the fracture line resulting from that force.

Epiphyseal fractures were produced in rats and rabbits to study the microscopic anatomy of these injuries and to try to relate these findings to future growth disturbance. An attempt was made to reproduce, in animals, fractures similar to those occurring in humans. Though the discussion includes only fractures of the lower extremity, much of what follows applies to any epiphyseal injury.

Anatomy

The anatomy of the epiphysis and of the epiphyseal cartilage plate has been clearly described in the past. Nevertheless, certain points in the description of this area need be emphasized in order to provide a clearer picture of the changes which take place when the epiphysis is injured. At a very early stage, the exact time depending upon the particular bone, the epiphysis is composed entirely of cartilage. Vascular tissue penetrates this cartilage mass and a small epiphyseal center of ossification appears. This center enlarges by enchondral ossification in all directions and from all of its surface until it approximates the shape of the pre-existing cartilage mass that made up the end of the bone. From this time onward, growth of the bony epiphysis takes place almost entirely through enchondral ossification at its periphery on the deep surface of the articular cartilage. The epiphyseal cartilage plate, which contributes the length growth of the shaft, henceforth adds little if any to the growth of the bony epiphysis.[1] As the bony epiphysis expands, its osseous tissue forms a fairly continuous structure beneath the articular cartilage. This is the subchondral bone. Its function is to support the articular cartilage. A similar bony structure is formed on the epiphyseal side of the epiphyseal cartilage plate. Its function is presumably similar to that of subchondral bone. This will be referred to as the subepiphyseal cartilage bone plate (Fig. 1). To describe it as a plate is somewhat misleading since it is by no means flat but follows the contour of the epiphyseal line. Damage to this bony structure seems to be of importance in determining the outcome of injuries in the epiphyseal region.

Resting upon this floor of bone is the epiphyseal cartilage plate and immediately adjacent to the bone is the first layer of cells of the plate. This is the basal or reserve layer. The cartilage cells are small and their ar-

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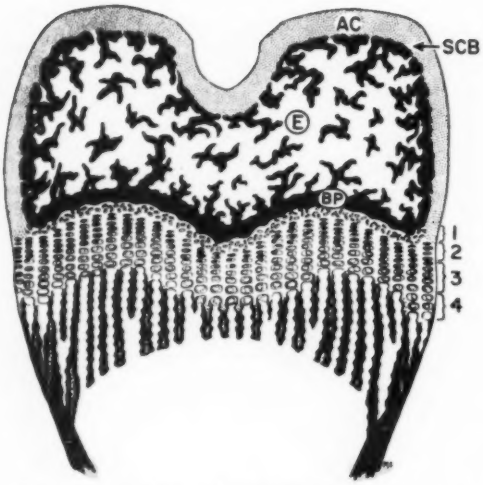
FIG. 1



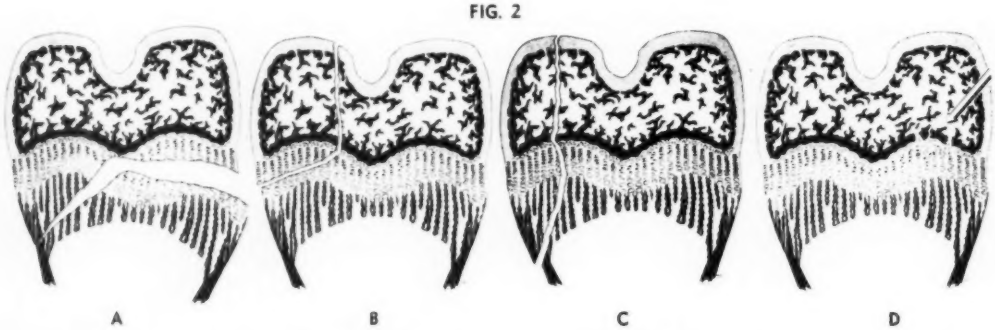
Anatomy of epiphysis and epiphyseal cartilage plate. AC, articular cartilage; SCB, subchondral bone; E, epiphysis; BP, subepiphyseal cartilage bone plate; 1, resting zone of cartilage cells; 2, zone of cell columns; 3, zone of hypertrophic cells; 4, zone of provisional calcification.

rangement is irregular. Contiguous with these cells is the zone of cell columns where the orderly linear arrangement of the cartilage cells is found. It is only in the reserve layer and in the first part of the zone of cell columns that mitotic figures have been observed.[2] The intercellular substance between the columns of cells is reinforced by bundles of collagen fibers. Nearer the diaphysis the cartilage cells expand at the expense of the intercellular material to form the zone of hypertrophic cells. This, as will be noted later, is an area of particular weakness. Finally, there is the zone of provisional calcification where calcium salts appear in the cartilage matrix. This layer is but three or four cells in thickness. The invasion of this area by vascular tissue and the deposition of bone matrix upon the remaining cartilage trabeculae constitute the primary spongiosa of the metaphysis. The bony trabeculae of this region are, for the most part, directed perpendicular to the epiphyseal cartilage plate.

Epiphyseal Injuries

Forces applied to the epiphyseal ends of bones may result in fractures through the structures described above. The direction the fracture line may take will depend upon the direction of the acting forces and upon the lines of least resistance within these structures to the forces applied. As was shown by Hass[3] and further by Harris,[4] the weakest part of the epiphyseal cartilage plate is in the zone of hypertrophic cells just adjacent to the zone of provisional calcification where the thin intercellular walls are reinforced by calcium salts. Hass made an incision through the perichondrium near the epiphyseal plate and showed that a "constant and natural separation will take place" when pressure is applied upon the epiphysis. Such a clear-cut line, however, is not usually found in clinical fractures, but is created when the force is purely a distracting one. Shearing forces may also result in separation in this zone.[4] In clinical fractures the forces are more complex and fractures through the epiphyseal area are usually not limited to the zone of hypertrophic cartilage cells.

FIG. 2



(A) *Type I fracture.* Note the fracture line begins in the zone of hypertrophic cells but involves other layers near the center of the bone (see Fig. 9). On the compression side the fracture involves metaphyseal trabeculae. (B) *Type II fracture.* The fracture line extends through the subepiphyseal cartilage bone plate. (C) *Type III fracture.* This fracture extends through the subepiphyseal bone plate, through the epiphyseal cartilage, and into the metaphysis. (D) *Type IV fracture.* Localized injury to the subepiphyseal cartilage bone plate (arrow) possibly the result of a longitudinal compression force.

Aitken[5] has grouped epiphyseal fractures into three types and this classification may be conveniently used in discussing the pathologic changes of these injuries.

Type I fractures (Fig. 2, A). In this case the fracture line travels horizontally across the epiphyseal plate usually for more than half its width, then leaves the cartilage and extends for a variable distance into the metaphyseal bone, emerging through its cortex. These fractures may be caused by shearing forces but are most frequently the result of forces causing angulation, such as abduction or adduction injuries. In the case of an abduction or valgus fracture of the distal femoral epiphysis, it should be noted that the force acting upon the medial portion of the epiphyseal plate at the time of injury is one of distraction. Distracting forces, as mentioned above, result in separation of the epiphyseal plate in its weakest area, the zone of hypertrophic cartilage cells. Concomitantly, as the medial distracting force is acting, a compression force is exerted on the lateral portion of the epiphyseal plate (Fig. 3). In the area of compression, the fracture line no longer follows the epiphyseal plate but extends into the cancellous bone of the metaphysis. This is well illustrated in the x-ray of the distal femur of a young football player who was struck on the lateral aspect of the leg, the knee being forced into a valgus position (Fig. 4). The metaphyseal fragment of bone remains attached to the epiphysis on the lateral or compression side. If the injury results from an adduction force there is lateral distraction and medial compression and the metaphyseal fragment of bone will be found on the medial side. This may be seen in the x-ray study of an experimentally produced adduction fracture in a rabbit's femur (Fig. 5). The fragment of metaphyseal bone accompanying the epiphyseal fracture may be extremely small, but fractures involving only the epiphyseal cartilage plate are rare. Such a fracture would theoretically involve only distracting and shearing forces, with no compression element. This type of injury can be produced experimentally.

FIG. 3

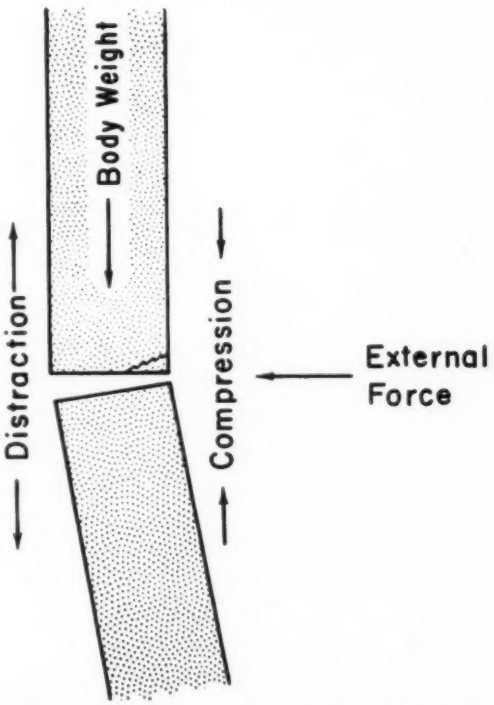


Diagram of the forces involved when the knee joint is struck from its lateral aspect.

FIG. 4

Type I abduction or valgus fracture of the distal femur of a young football player. Note the large metaphyseal fragment of bone on the compression (lateral) side.

FIG. 5

Type I adduction of the distal femur of a rabbit. Note the metaphyseal fragment of bone lies on the compression (medial) side.

Type II fractures (Fig. 2, B). Here the fracture line passes vertically from the articular surface, through the bony epiphysis and then extends horizontally along the epiphyseal cartilage plate to emerge at its periphery. Aitken[5] describes two varieties of type II fractures. In the first, the horizontal component of the fracture lies on the epiphyseal side of the cartilage plate and causes no damage to it. From the microscopic studies described above, it seems doubtful that this type of fracture could occur, except perhaps, in very young patients in whom the epiphysis is still predominantly cartilage and the small ossification center is still growing from its entire circumference. The horizontal component of the second and usual variety of type II fracture involves the zone of hypertrophic cartilage cells. To reach this zone the vertical portion of the fracture line must pass through the subepiphyseal cartilage bone plate. This type of injury may be the result of a combined transverse shearing and longitudinal compression force. It is most commonly seen in the ankle where the inverted talus impinges against the medial malleolus; in this instance it is due to the peculiar anatomic configuration of the distal tibial epiphysis. A rather unusual location for a type II fracture is the distal femur. The roentgenogram of such a lesion, which resulted from a football injury, is seen in figure 6.

Type III fractures (Fig. 2, C). The fracture line in this case extends vertically from the articular surface through the bony epiphysis and the epiphyseal cartilage plate and continues into the metaphysis to emerge through its cortex. The injury is usually caused by a crushing force directed in the long axis of the bone, and as a rule results in serious damage to the epiphyseal line and its underlying bone plate. Growth disturbances are quite common after such injuries. Type III fractures are most frequently seen at the ankle (Fig. 7).

FIG. 6

Type II fracture of distal femoral epiphysis resulting from a football injury.

A *fourth type* of epiphyseal fracture has been produced experimentally and suspected clinically (Fig. 2, D). Abduction or adduction forces were applied to the knees of rats. Subsequent x-ray studies in some instances failed to demonstrate any definite fracture. Later microscopic studies revealed bone formation extending across a small segment of the epiphyseal line. A localized crushing injury of the subepiphyseal cartilage bone plate was suspected. Occasionally late deformity has developed following injury to the knee in which original roentgenograms showed no definite epiphyseal fracture. Such deformities may possibly be the result of this type of lesion.

Experimental Studies

Young white rabbits and rats were anesthetized with ether, and fractures were produced at the distal femoral or proximal tibial epiphyses by forcibly angulating the leg just above or just below the knee joint. Roentgenograms were taken with the knee in the deformed position after which the fracture was reduced. Type I injuries were consistently produced at the distal femur. When the force was applied suddenly with sharp angulation a snap could be felt, and a relatively large fragment of metaphyseal bone, always on the compression side, would be found accompanying the epiphyseal fragment. When the force was applied gradually, and with some traction, no definite snap was felt, and the x-ray examination would demonstrate little if any metaphyseal bone with the epiphyseal fragment.

The animals were sacrificed at varying intervals following injury and microscopic studies were made of the involved epiphysis. Studies made of the type I injury within a few days following fracture showed a fairly constant pattern (Fig. 8). Evidence of periosteal tearing on the distraction side was usually present. Beneath the periosteal tear the fracture line was found to enter the epiphysis through the zone of hypertrophic cartilage cells and continue in this layer until

FIG. 7

Type III fracture at the ankle.

FIG. 8

Type I fracture in a rat (low power). The fracture line passes along the cartilage plate on the distraction side and extends into metaphyseal bone on the compression side.

it reached the center of the bone where, at the curved apex of the epiphyseal plate, the fracture line often involved the deeper layers of cartilage including the resting or reserve zone of cells (Fig. 9). The subepiphyseal cartilage bone plate, however, remained intact. On the compression side of the femur the fracture line left the epiphyseal cartilage and extended into the metaphyseal trabeculae and through the cortex. The periosteum on this side was not torn, but subperiosteal hemorrhage was noted. In sections made at greater intervals following the type I injury, though growth irregularities were noted in the epiphyseal cartilage, no evidence of bony union across the cartilage plate was found, nor was there any suggestion of injury to the subepiphyseal cartilage bone plate.

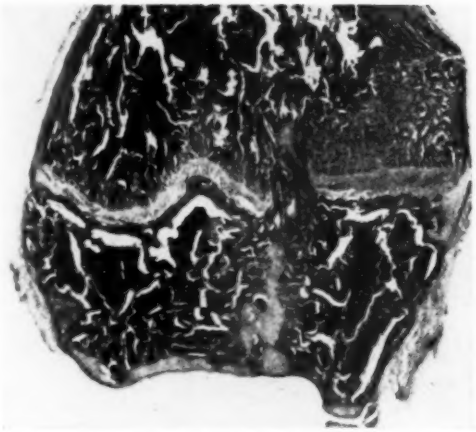
Fractures produced at the proximal tibial epiphysis were not as consistent as the femoral injuries. Type I fractures were created as well as the type IV lesion mentioned above. In the latter injury only a small portion of the subepiphyseal cartilage bone plate was disturbed, yet microscopic sections made 3 weeks after injury showed discontinuity of the epiphyseal cartilage and extension of osseous tissue from the bone plate toward the metaphysis through the gap in the epiphyseal cartilage.

Type III injuries were produced at the distal femoral epiphysis by opening the knee joint under anesthesia and inserting a thin blade vertically through the medial femoral condyle, across the epiphyseal line and into the metaphysis. This did not reproduce the force that results in the clinical type III fracture, nevertheless, the course of the fracture line was similar. Late microscopic sections of this lesion showed a gap in the epiphyseal cartilage at the site of the break in the subepiphyseal cartilage bone plate. Through this gap either fibrous or osseous tissue extended between the epiphysis and the metaphysis (Fig. 10). In some sections definite bony union across the epiphyseal line was noted.

FIG. 9

Type I fracture in a rat, 5 days after injury, showing the fracture line is not limited to the zone of hypertrophic cartilage cells.

FIG. 10



Type III fracture in a rat showing bone extending through the cartilage plate uniting epiphysis to metaphysis.

The above studies suggest that injury to the bony plate which supports the epiphyseal cartilage is an important factor in the development of serious growth disturbances following epiphyseal fractures. If this bone plate escapes injury, fusion across the epiphyseal line is not to be expected. If the bone plate is fractured, though not severely crushed, osseous union across the epiphyseal line may, but does not necessarily occur. In extensive injuries to the subepiphyseal bone plate union of the epiphyseal and metaphyseal bone at the site of the injury is to be expected.

Summary

Microscopic studies were made of epiphyseal fractures produced in the lower extremi-

ties of rats and rabbits. These studies suggest that injury to the subepiphyseal cartilage bone plate is an important factor in the creation of bony fusion across the epiphyseal line. Fractures extending horizontally across the epiphyseal plate are not confined to any single zone of cartilage cells, though the greater portion of the fracture usually involves the zone of hypertrophic cells. Distracting, transverse shearing, and rotational forces tend to produce defects in the cartilage plate; compression forces usually result in damage to the bony portions.

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Meet Us

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NEW ORLEANS

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Rigid Medullary Fixation of Forearm Fractures*

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The authors feel they have been successful in the use of the intramedullary rod for the fixation of fractures of the radius and ulna.

FRACTURE OF THE SHAFT of the radius is still an unsolved problem of management.[1-3] The ideal to be sought is early accurate reduction and fixation which is sufficiently stable to allow early resumption of functional use and rehabilitation. These ideals have been achieved in the case of the fractured femoral shaft by intramedullary fixation, but these principles have not as yet been satisfactorily applied to the forearm, especially to fractures of the radial shaft. It is well known that treatment by closed methods of similar fractures which occur in the radius and the ulna of the same forearm almost invariably results in more rapid healing of the radius. Isolated fractures of the radial shaft almost always heal more promptly by closed management than do similar fractures of the ulna. The reason for this apparent difference in healing potential of the bones of the forearm can be a source of interesting conjecture, involving the relative vascularity or the impaction stimulus on functional use of the hand, which is absorbed predominantly by the radius. The end results of displaced complete fractures of the radial shaft treated by closed methods has not been entirely satisfactory. This, in most cases, is attributed not to nonunion, if the immobilization has been adequate, but to malunion, usually with angulatory or rotational malalignment and with loss of motion in supination or pronation or both. Because of these poor end results, many have resorted to more frequent open reduction with accurate reduction and internal fixation.

With the advent of open treatment of these fractures, delayed union rather than malunion became the problem. This has variably been attributed, in the case of plating, to loss of the fracture hematoma, stripping of the periosteum, or too rigid fixation with holding of the fracture fragments apart. The alternate approach to the healing problem by the use of cortical grafting was again disappointing in fracture healing time, and there was then added the complication of late fracture of the graft at the fracture site where the graft was finally vascularized and incorporated. Prolonged immobilization was required by both methods with its inherent disadvantages of stiff joints and atrophy, plus the disadvantages of the plaster itself.

With the introduction of intramedullary nailing, there have been repeated efforts to adapt this useful method to fractures of the forearm. The ulnar shaft, with its relatively straight medullary canal and accessible extremities at olecranon and styloid, adapted itself readily to this method. The medullary fixation used for fractures in the ulna has proved to be sound and is in popular use today. Paradoxically, the use of medullary nailing for the ulna with plate-screw fixation or cortical grafting of the radius, has resulted in prompt healing of the ulna and relatively slower healing of the radius. The method of fixation of the radial fracture seems to be the cause of the relatively delayed healing. Obviously, the solution lies in applying the same type of medullary fixation to the radius.

The radius, however, has not been a popular site for medullary fixation. The unpopularity of medullary nailing of the radius has been based upon the failure of the rod to control rotation or to provide firm fixation, or to

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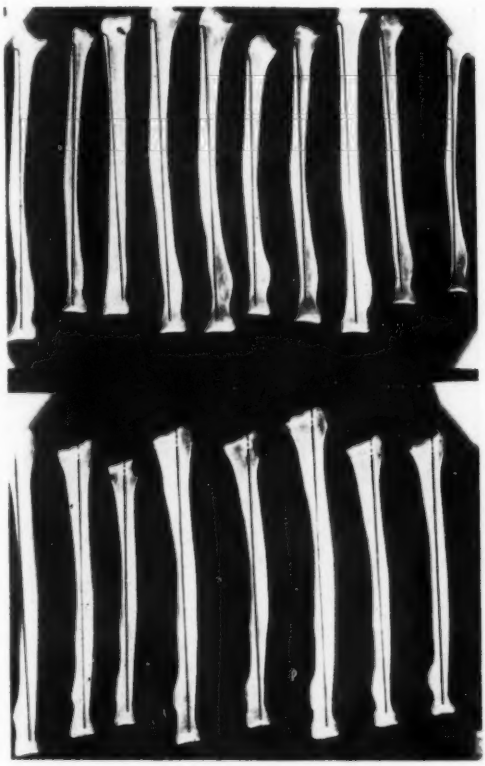
FIG. 1



the mechanical difficulties of trying to apply a rod curved in concavity from the radial styloid into the medullary canal, which, from this approach, is curved in convexity.[4]

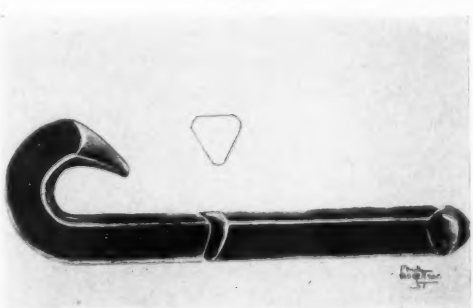
A study of the anatomy of the medullary canal of the radius shows it to be an elongated hour glass shape with the proximal four-fifths being of fairly uniform diameter and the distal canal flaring widely to its distal articular extremity. The distal metaphysis flares almost uniformly in distance medially and laterally from the midline projection of the shaft canal as it curves toward the ulna and to the superficial styloid. The proximal flare of the hour glass is represented by the button-like head. In the adult, the radial head and canal in its proximal one-fifth (proximal to the bicipital tubercle) is filled with cancellous bone. The same is true of the distal metaphyseal flare, comprising the distal one-fifth of the bone. The medullary anatomy is not dissimilar from the gross anatomy of the medullary canal of the femur.

The curve of the medullary canal, concave toward the ulna, is more apparent than real, and a straight line projection of the line of the canal of the middle three-fifths of the radius easily falls within the proximal head and distal metaphyseal flare in any position of rotation. The curve of the radius does not exceed the normal curve of the femur which is so ideal for medullary nailing. The problem then resolves itself to the proper placement of a rod in this midline of the medullary canal and the use of a suitable rod to provide secure fixation in the prevention of motion, angulation and rotation.

A study was made of 121 adult unselected cadaver radii to confirm these anatomic observations (Fig. 1). Roentgenograms were made of each of these specimens in the anteroposterior and lateral projections. The dorsal radial tubercle (Lister's tubercle) was identified by a metal marker on each specimen. Straight lines were then drawn from the marked tubercle the length of the medullary canal. It was found that this easily palpated tubercle landmark fell roughly in the line of the projected shaft of the medullary canal, and it was possible in each instance to draw a straight line proximally from this point into the proximal radial head, indicating that it was possible for a semi-rigid rod to conform to the slight curve of the medullary canal in all cases.

Based upon these findings, rigid intramedullary nailing of these fractures has been performed during the past 30 months on fractures requiring open reduction. The rod used is made of S.M.O. stainless steel and is straight in linear conformation. It is solid, and triangular in cross section (Fig. 2). Three diameters, 3 mm., 4 mm., 5 mm., have proved

FIG. 2



adequate for all adults treated. All rods were 30 cm. in length and were cut at the time of operation. The rod is formed with a hook on its end, as popularized by the Rush rod, to facilitate its subsequent removal. This rod, by its rigidity and its fixation in cortex and cancellous bone distally, cancellous bone proximally, and its tight fit to the shaft of the medullary canal, provides stable fixation against angulatory and torsional deforming forces.

Technic

The fracture line is exposed and only the minimum of periosteum is disturbed. Stripping of interosseous membrane is avoided and only enough exposure to clear the debris and to accurately realign the fracture is required. The contour of the fracture line will provide accurate guidance for rotary alignment. A rod of proper diameter is selected by trial in the canal to allow a tight medullary fit. Drilling of the canal for a short distance is occasionally required. The determination of length is made by measurement on the surface of the forearm with the radius reduced, from Lister's tubercle to head of radius minus about 1 cm. The rod is then cut to length, inserted, and driven proximally from an oblique drill hole just proximal to Lister's tubercle on the dorsum of the wrist through a separate short transverse incision. This landmark is easily palpated and exposed and is devoid of tendons. A slight bend may be made near the rod tip to facilitate its insertion. The protruding hook does not lie in contact with any important structure, as can be seen at operative exposure. It lies between the long thumb extensor and the radial wrist extensor tendons, and its site is deep enough to be covered by adequate soft tissue to prevent discomfort or the fear of compounding on minor contusion trauma. It is also easily accessible for secondary removal after healing of the fracture. The rod is driven proximally to the fracture site, the fracture reduced and held, and the rod driven the length of the proximal fragment to seat the nail hook at the wrist (Figs. 3 and 4). The fracture line should then prove stable through a full range of motion of the forearm.

FIG. 3

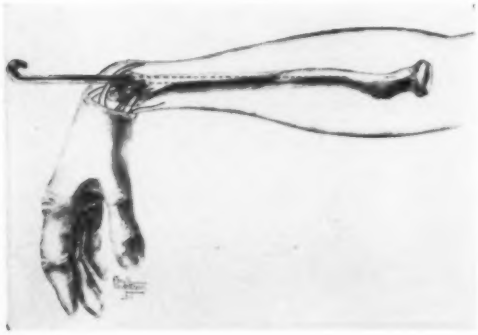
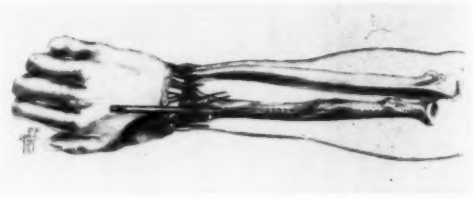


FIG. 4

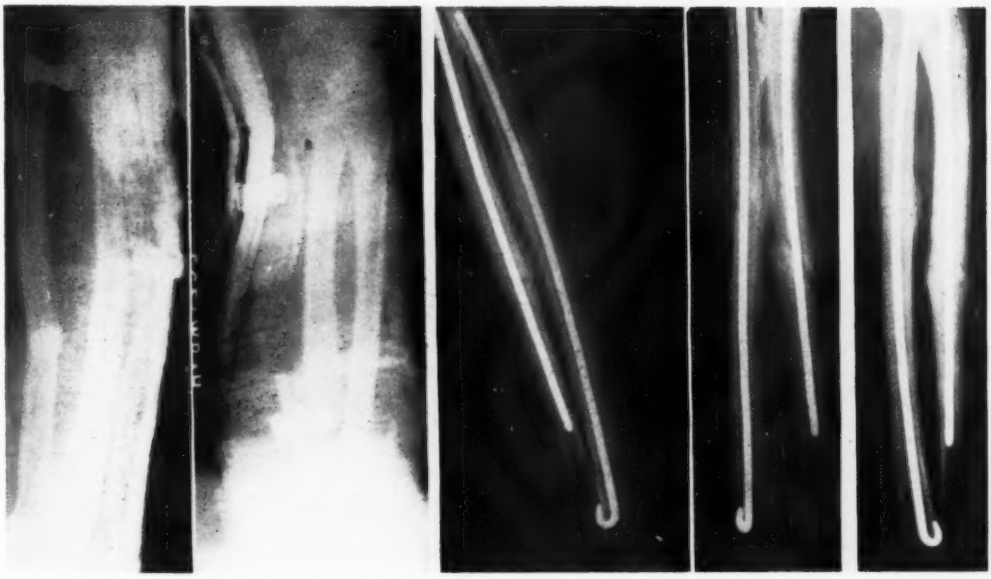


Essentially the same technic is used for the ulnar fracture. The fracture is exposed, a rod selected for tight fit in the medullary canal, and after measuring on bony landmarks from olecranon to ulnar styloid less about 1 cm. the rod is cut to length. The olecranon is exposed by a separate transverse incision above its tip. The triceps tendon is split to the bone and retracted so that a drill hole may be placed for the rod. The hook on the end of the rod is cut short so that an excess does not lie above the level of the bone, and the rod is driven to the fracture line. The fracture is reduced and the rod seated.

Immobilization following operation consists of an elastic compression dressing over the forearm, reinforced by sugar-tong plaster splints around the elbow to distal palmar crease and to axilla. The extremity is elevated postoperatively and full finger motion under supervision is initiated at once. A sling is substituted for elevation in 3 to 4 days and the patient becomes ambulant. Skin sutures are removed in 10 to 12 days, all immobilization is discontinued, and functional light use of the extremity is urged.

At this type of military medical facility, where the patient and his job requirements are uncontrolled after release from the hospital, rehabilitation of the patient to the point of being "fit for duty" is necessary. The patient is started on a program of occupational therapy at the time the dressing is re-

FIG. 5



A B C

(A) Preoperative. (B) Eight weeks postoperative. (C) Twelve weeks postoperative.

moved. This is aimed at light active use of the whole upper extremity with activities requiring all motions, including supination and pronation. Heat, massage, passive motion, and stretching are avoided. Such heavy use as would be necessary in sports is also avoided until fracture healing permits, and at this time the patient is returned to duty.

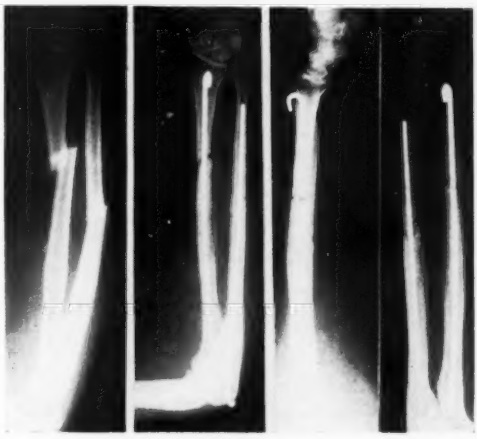
Results

Experience with this method indicates that fracture healing of the radius is prompt and again parallels the results of closed fracture treatment, in that healing of radial fractures is more prompt than the ulnar fracture treated by similar medullary nailing.

At this Medical Center, in the four years prior to 1955, no single method of fracture fixation was used in the forearm. The methods employed included single and multiple Kirschner wires, Rush rods, Kuntscher "V" nails, plates and screws, and bone grafting. One hundred and ninety-nine cases of all types of forearm fractures were treated. Most of these were war wounds. All of the methods were followed by long arm plaster immobilization with the well known subsequent stiffness of joints and muscle atrophy. All the patients returned to limited duty with significant residuals in the form of limitation of motion at the elbow, and in supination and pronation.

Since May, 1955, medullary nailing has been utilized in those cases requiring open

FIG. 6



A B C

(A) Preoperative. (B) Postoperative. (C) Six weeks postoperative.

reduction. Thirty-two patients have been treated in this fashion, comprising 9 isolated fractures of the radius, 13 isolated fractures of the ulna, and 10 cases in which both bones of the forearm were so treated. A total of 19 radii and 23 ulna, making 42 bones treated in all. Rehabilitation has been rapid and hospitalization time has been shortened to an average of 10 weeks. Elbow motion and supination-pronation is 50% of normal in an average of 3 weeks and complete in 6 weeks. Bony union has been found to be well advanced, clinically, and often by x-ray examination in 8 weeks, to a point where light work could be undertaken. The psychologic benefit of the patient's not being encumbered by a plaster cast is a significant factor.

Case Reports

Case 1. (Fig. 5, A, B, and C) A 19 year old private, during a basketball game on December 13, 1956, sustained a compound comminuted fracture in the middle third of both bones of the left forearm. Initial examination revealed diminished sensation of the fourth and fifth fingers. The compounding wound was 3 mm. in length and probably compounded from within. By 6 days after the injury the wound had healed, and under regional anesthesia open reduction and intramedullary fixation was performed on both bones by utilizing triangular hooked rods. The patient's wounds healed per primam. The sutures and plaster splints were removed in 10 days, and within 3 weeks there was approximately 50% return of pronation, supination, and elbow motion. The patient, however, still had residuals of his ulnar nerve palsy, though sensation and function were returning. By 4 weeks the patient had a full range of motion. Films at 8 weeks revealed beginning union, and at 12 weeks union was sufficient to permit his return to duty.

Case 2. (Fig. 6, A, B, and C) A 22 year old white man, while playing baseball on July 11, 1957, fell while running and sustained a compound fracture of both bones of the left forearm. Following examination, which revealed no nerve deficit, the wound was debrided. Four days after debridement, the wound was closed. Seventeen days later an open reduction with internal fixation was performed, utilizing triangular hooked rods in both bones of the forearm. All wounds healed without incident. Ten days after operation the sutures and plaster splint were removed and the patient began active motion of the extremity. At the end of 3 weeks he had regained half of his range of motion at the elbow and forearm, and by 6 weeks this motion was complete. He was discharged to duty on the eighth week.

Summary

Accurate open reduction of a limited number of fractures of the shaft of the radius and ulna has been presented. Treatment was by rigid intramedullary fixation without the use of plaster or splint immobilization. The rapidity of bony union and the resumption of extremity function justifies further experience with this method.

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Residual Sensory Changes in the Chronic Phase of Poliomyelitis*

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The sensory changes which may remain after poliomyelitis may be of significance in the rehabilitation of the patient.

MUSCULAR PARALYSIS and musculoskeletal deformity are the universally familiar hallmarks of chronic poliomyelitis. These conditions are so tangible and obtrusive that they readily shade the presence of lesser nervous disruptions which may likewise persist. While sensory symptoms are well known to exist, particularly in the acute stage, poliomyelitis has not properly been considered a disease of the sensory mechanism. Pathologists, however, in their descriptions of the morphology of anterior poliomyelitis have discussed the presence of inflammatory changes and their sequelae in the sensory portions of the central nervous system. Swan,[1] in his examinations, found occasional severe involvement of the posterior horn, although such involvement was usually less than in the anterior horn. He concluded that there was no absolute specificity of the polio virus for the motor cells. Bodian[2] stated that, "since lesions, sometimes severe, are found in the posterior and intermediate horns of the spinal cord, as well as in the spinal ganglia, it is possible that internuncial discharge pathways and reflex pathways may be injured sufficiently to contribute to motor dysfunction." The very presence of motor disability implies a sensory loss in that the subject is unable in some measure to extend himself or make a primary approach to contact his environment. Environment obtrudes as it will.

Sensory deficits in the convalescent or chronic phase of poliomyelitis have rarely been described. Physicians engaged in the treatment of such patients have been aware of these deficits. Boyd[3] describes asymptomatic, far advanced stone formation in the urinary tract, masked by lack of sensation. Plum[4] carefully detailed case reports of two patients with persisting sensory loss in the lower extremities, and thought this to be due to neuronolysis of root ganglia because of the frequency of this finding in pathologic studies. Conversely, Frohring and his associates[5] have shown a lower vibratory threshold in involved motor segments.

Sensory changes, particularly when contrasted with the primary disabling motor deficits are, no doubt generally small, inconstant, and of far less functional significance. Yet, they do, in many patients, contribute to the complexity of the case. Position sense, particularly, is at least partly dependent upon a functioning motor apparatus with its network of stretch receptors, and indeed, no sensation is more vital to a well integrated motor system. The purpose of the present study was to more nearly define the areas and degrees of alteration in the sensoria of patients whose poliomyelitis has reached the chronic stage.

The impetus for the study was the more or less frequent observation of experienced physical and occupational therapists that many such patients under treatment had characteristic performance curves. In these cases the functional performance of the patient deteriorates as the week progresses, so that by late Thursday, or at latest, early Friday, therapy and training are little more than a vain waste of time. This pattern does not in all such cases appear to be related to muscular fatigue, although this certainly is the first explanation that invariably comes to mind. Some observers are moved to describe the observation as a manifestation of simple boredom, but this also seems too superficial a definition, espe-

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†From the Georgia Warm Springs Foundation, Warm Springs, Ga.

cially in the more highly motivated subjects. It may be postulated that in particular cases the peripheral sensory insufficiency is so great that a high degree of compensation by the intensive concentration of other senses (such as audition or vision), becomes necessary to adequately coordinate motor performance. It is, perhaps, the erosion of the compensating mechanism that is partially or completely responsible for the aforementioned performance pattern.

Methods

Twenty patients with residual paralyses of upper extremities were meticulously and searchingly examined with reference to peripheral sensation. The subjects ranged in age from 10 to 38 years. The duration of disease ranged from 9 months to 17 years. Ten subjects had more involvement in the left upper extremity, and 10 were more involved on the right.

Criteria for selection of cases were as follow:

1. Patient must be at least 10 years of age so that no difficulty in communication should arise.

2. The course of the poliomyelitis must have reached a chronic phase.

3. The subject must have one relatively functional and one relatively nonfunctional upper extremity.

The third condition was included in order that each subject might, to some degree, be said to serve as his own control. In the actual selection of subjects, while some patients presented a "normal" upper extremity on one side with flail extremity on the opposite side, others were quite severely involved in both upper extremities. No patient, however, had more function than simple grasp on the nonfunctional side; all had more function than this on the better side.

Upper extremities only were examined. Examination was done comparatively. Patients were blindfolded during the entire procedure. Five subjects were processed in the supine position because of encasement in body spicas; others were comfortably seated with upper extremities resting on a lapboard.

Testing was performed in 8 categories.

1. Relative appreciation of pain was tested by stimulating comparable areas on both upper extremities with a sharp pin.

2. Touch was examined in the same way using a cotton ball.

3. Vibratory sensation was examined with a C-128 tuning fork over comparable bony prominences and joints.

4. Stereognosis was tested by requiring the subject to identify various common small objects as well as an assortment of common solid materials.

5. Position sense was tested in 3 ways. (a) The entire upper extremity was moved from place to place on the lapboard and the patient required to describe the altered position in two planes. (b) The fifth finger was moved and the patient required to identify flexion, neutrality and extension at the metacarpophalangeal joint. The thumb was moved and the subject required to define extension, abduction, and flexion at the metacarpophalangeal joint. (c) The relatively nonfunctional hand was manipulated into complex but reproducible positions; the subject was required to make mirror images of these positions with the relatively functional hand. If one or another finger did not conform, the subject was specifically asked to concentrate on that particular segment. Failure to properly describe position or duplicate it after this specific reminder was considered to be error.

6. Barognosis was examined by placement of weights of equal surface area in the palms of hands resting on the lapboard. Magnitude of weights used was 1, 1½, and 2 pounds. The subject was required to describe a succession of these weights in terms of "more, less, same."

7. Appreciation of deep constrictive pressure was examined by application of a sphygmomanometer to the forearm and successive inflations to various pressures in the 50 to 90 mm. Hg. range. Again, the subject was directed to define pressures in terms of "more, less, same."

8. A combination of cutaneous and deep fingertip sensitivity was examined by the writing of ¼" size numbers on pads of the distal phalanges. Two numbers were written on each finger. The subject was asked to identify the numbers.

Results

A summary of the results is shown in table 1.

Prior to the examination, 15 subjects did not believe that any difference in sensation existed from one side to the other. Four believed sensation to be generally more acute on the less involved side; one thought it to be more acute on the more involved side.

The categories of pain, touch, and vibration are conceded to be compilations of purely subjective data. As seen from the table they present no suggestive evidence of major sensory disturbance. However, individual cases are worthy of remark. One subject stated that the cotton ball gave an abrasive sensation to her involved side. Another

TABLE 1

COMPARISON OF THE SENSITIVITY OF THE MORE PARALYSED SIDE WITH THE LESS PARALYSED SIDE (20 SUBJECTS)

Modality	*Much More*	*Slightly More*	*Equal or Spotty*	*Slightly Less*	*Much Less*
Pain	1	7	7	5	0
Touch	0	5	10	5	0
Vibration	0	5	12	3	0
Stereognosis	0	0	8	8	4
Position					
(a) Arm*	1	2	8	4	0
(b) Finger	0	2	5	9	4
Barognosis	2	7	1	9	1
Deep pressure	10	4	2	2	2
Finger tip sensitivity	1	2	6	10	1

In the formation of mirror images of complex hand configurations, one subject performed without significant error; 10 subjects made errors of mild to moderate degree; 9 subjects' performance showed great distortion of appropriate response.

*Supine patients were not included in arm position test.

felt the pin as sharp on the involved side and as dull pressure on the other, although the intensity was similar. Several subjects noted a large difference in the duration of the after-impression of a particular stimulus.

All other categories were grossly subject to measurement. Appreciation of deep constrictive pressure was seen to be much more acute on the involved side. In several cases it might be described as uncanny; one subject was able to detect 2 to 4 mm. Hg. variation in a range of 50 to 90 mm. Hg., and another could identify 4 to 6 mm. Hg. variation without error. The usual fairly consistent distinction of pressure change on the least involved side was 10 to 16 mm. Hg.

It may be noted that stereognosis and position sense are definitely poorer in the more involved side. In testing stereognosis it was found that errors in texture were twice as common as errors in configuration. One subject only made a single error on his uninvolved side. It was also found that a subject who did err in configuration tended to make two or three such errors.

The frequent aberration of position sense was perhaps the most important demonstration of this study. It was actually the most expected finding since a known deficiency in muscle tonus existed. Interestingly, there was relatively little loss of position sense in the hands where tightness or contracture existed. It cannot be too emphatically remarked that a significant number of these patients had not the grossest conception of a complex hand configuration while blindfolded. In others a hazy and imperfect conception was present. The most common errors were in distinguishing abduction and extension of the thumb, abduction and adduction of the fingers, and degrees of flexion and extension of the fingers. Finger dysmetria was a common finding. It appears quite extraordinary that no single subject suspected a loss of position sense prior to the examination; several seemed to be profoundly shocked at the disclosure.

Comments and Conclusions

Peripheral sensation is commonly involved in anterior poliomyelitis and in many cases the involvement persists. Although the sensory loss is of minor magnitude in comparison to the motor disability, it is often sufficient to adversely affect reflex patterns, and to complicate weakness with incoordination.

The deficit is sometimes severe enough to add great complexity and frustration to the recovery process. The heightened irritability and inconsistency of nervous equilibrium so commonly seen in the patient with poliomyelitis, and so often labeled "functional," may have more than an indirect relationship to peripheral sensory insufficiency. Every patient with poliomyelitis should have a thorough screening of his peripheral sensation so that any areas of major deficiency may be identified and, possibly, properly compensated. The need for such compensation must be impressed upon the consciousness of the sensation deficient patient if he is to avoid frustration and poor performance in treatment, recreation, and future employment. If he must see his hand in order to use it, he ought to be aware of that necessity.

It must be emphasized to physical therapists and occupational therapists attempting muscle re-education and coordination of paretic segments, that it is unwise to place great reliance and faith upon the individual patient's proprioception during the training process. It is highly important to reinforce proprioceptive stimuli with visual aids and other unmistakable signals to the sensorium. Physicians must understand that sensory aberrations in these patients might well derange the symptomatology of any superimposed organic disease process. Diagnosis and therapy should be directed with this consideration.

Summary

Residual sensory changes have rarely been described in patients in the chronic stage of poliomyelitis. In an effort to define areas of sensory alterations, meticulous peripheral sensory examination was performed on 20 patients with asymmetrical upper extremity involvement. Aside from occasional involvement of all types of peripheral sensation, it was noted that position sense and stereognosis were generally more acute on the more functional side, and that deep constrictive pressure was more appreciable on the more paralysed side. It is important to know the areas of major sensory insufficiency in the individual patient and to compensate them if possible.

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The Effect of Prednisone in the Prevention of Esophageal Stricture Following the Ingestion of Lye*

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Any method which may reduce the incidence of esophageal stricture after the intake of lye deserves trial. Further experience in the use of cortisone will be needed to establish its usefulness.

Introduction

THE ADMISSION of 24 children in the past two years to the pediatric service of the Jackson Memorial Hospital because of the ingestion of lye emphasizes the importance of this problem in Miami. The South is notorious for lye burns because of the custom of using lye as a cleanser in homes of low income.[1] Corrosive esophagitis occurs following the accidental swallowing of lye by young children and ingestion for suicidal purposes by adults. Other agents are relatively less common as a cause of corrosive esophagitis in this country, but occasional cases are reported due to hydrochloric or sulfuric acid, Lysol, ammonia, or potassium permanganate. A very high incidence of corrosive burns of the esophagus occurs in certain Central European countries such as Bulgaria[2] due to the ingestion of sulfuric acid. Another endemic area is South Africa where lye is one of the favorite suicidal agents.[3,4]

The prognosis following ingestion of lye depends on the amount, type and concentration of the lye swallowed. In general, powdered lye is swallowed by children who dip their fingers in the can and then suck their fingers. Although they may have severe burns of the mouth, the esophagus may be spared. Since liquid lye is more easily swallowed, it may cause sufficient burn to produce marked necrosis, sloughing, and scarring of the esophagus or even death. Adults who swallow lye with suicidal intent may take enough to cause perforation of the stomach or pyloric stenosis, although ordinarily the neutralizing action of the stomach will protect it from more than superficial and temporary injury.[5]

Despite the importance to this study, in reviewing the literature it is difficult to arrive at a reliable figure for the incidence of esophageal stenosis, since the ages of the patients differ and, therefore, the amounts ingested vary. Furthermore, few articles state whether the patients reported upon represent all the cases of ingestion of lye in an area or only the most severe or referred cases. Estimates of eventual esophageal stenosis in children run from 40 to 84 per cent. One of the most extensive reports is that of Marchand who reports 208 cases from South Africa over a 6 year period. Of these, 137 were seen soon after ingestion, of whom 5% died in the acute stage. There were 41 children under 14 years of whom approximately 75% required dilation for stricture.[4]

Until recent years the problem of therapy after the ingestion of lye revolved primarily about the advisability of prophylactic bouginage. In 1923 and 1924, Salzer[6] and Bokay[7] showed that stricture of the esophagus could be prevented by dilation with weighted bougies beginning on the second to fourth day after the ingestion and continuing for several weeks. This technic has been advocated by most pediatric groups in this country, but particularly by the Johns Hopkins[8] and Duke groups.[9] Although this procedure seems effec-

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TABLE 1

Patient	Age (Mos.)	Race	Sex	Type of Lye	Duration Follow-up	Stricture	Remarks
1	13	C	F	Liquid	< 6 mos.	0	Less than optimal therapy
2	17	C	F	Liquid	> 6 mos.	+	Less than optimal therapy
3	16	C	F	Liquid	> 6 mos.	0	
4	14	C	F	Liquid	> 6 mos.	0	
5	25	C	M	Dry	> 6 mos.	0	
6	12	W	M	Dry	> 6 mos.	+	Esophageal perforation following retrograde bouginage; less than optimal therapy
7	20	C	M	Liquid	> 6 mos.	+	Perforated gastric ulcer after 3 weeks of therapy
8	11	C	M	Dry	> 6 mos.	0	
9	14	C	F	Dry	< 6 mos.	0	
10	36	C	M	Dry	> 6 mos.	0	
11	56	C	M	Liquid	> 6 mos.	+	
12	24	C	M	Dry	> 6 mos.	0	
13	24	C	M	Dry	< 6 mos.	0	
14	18	C	F	Dry	> 6 mos.	0	
15	36	C	F	Liquid	> 6 mos.	0	
16	30	C	M	Liquid	< 6 mos.	0	Received prednisone 15 days
17	30	C	F	Dry	< 6 mos.	0	Received prednisone 7 days
18	36	C	M	Dry	< 6 mos.	0	Received prednisone 14 days
19	48	W	F	Liquid	< 6 mos.	0	Received prednisone 8 days
20	30	C	F	Liquid	< 6 mos.	0	Esophageal perforation at esophagoscopy
21	36	C	M	Liquid	< 6 mos.	0	Received prednisone 5 days
22	24	C	M	Liquid	< 6 mos.	0	
23	24	C	F	Liquid	< 6 mos.	+	

tive in preventing marked stricture it is expensive in terms of time and effort and has not had universal acceptance. In experienced hands the incidence of esophageal perforation has been very low despite bouginage during the period of acute inflammation. However, many surgeons have advised against such a regimen because of this danger.

The demonstration of the anti-inflammatory effect of cortisone suggested its use in an attempt to prevent the proliferative response leading to fibrosis and cicatrization following lye burns. Experimental studies demonstrating this effect were reported by Rosenberg in 1951[10] and 1953.[11] Although he was able to show that cortisone resulted in much less stenosis in rabbits subjected to lye burns of the esophagus, there was an increase in the incidence of fatal infections. The simultaneous use of cortisone and penicillin, however, gave improved results even though the enhancement of infection remained a problem. Similar beneficial results were reported by Weisskopf[12] in experimental lye burns of dogs and independently by Burian[13] and Floberg[14] with cats. Several case reports have shown favorable results in humans with corrosive burns of the esophagus treated with cortisone and antibiotics.[12,15-19] Ray and Morgan[20] have presented a series of 11 patients so treated, in only one of whom did stricture develop.

With this body of experimental evidence, and when it became evident that we would see frequent instances of lye burns in children on our service, it was decided to observe a series of children treated without prophylactic bouginage, but with steroid and antibiotic therapy.

Methods

Patient material for this study consisted of 21 children from the Jackson Memorial Hospital and 2 children from the Talmadge Memorial Hospital in Augusta, brought in shortly after the ingestion of lye. The time elapsing from ingestion until admission varied from a few minutes to 24 hours, but was generally less than 1 hour (Table 1). The distribution of these patients as regards age, sex, race and type of lye ingested are shown in table 2.

The original plan of therapy employed various features as shown in table 3. Prednisone* was administered by mouth according

*The prednisone was generously supplied as Meticorten for this study through the courtesy of the Schering Corporation.

TABLE 2

TYPE OF PATIENTS

Age in Months					
Total	*12-18*	*18-24*	*24-30*	*30-36*	*36-48*
23	7	4	6	5	1
Race		*Sex*		*Type of Lye*	
Negro	21	Male	11	Dry	10
White	2	Female	12	Liquid	13

TABLE 3

MANAGEMENT OF LYE BURNS

1.	Prednisone as follows:	
	20 mg. every 8 hrs.	for 4 days = 60 mg. per day
	20-15-20	for 4 days = 55 mg. per day
	15-15-20	for 4 days = 50 mg. per day
	15-15-10	for 3 days = 40 mg. per day
	10-10-10	for 3 days = 30 mg. per day
	5-10-5	for 3 days = 20 mg. per day
	5-0-5	for 2 days = 10 mg. per day
	5-0-0	for 2 days = 5 mg. per day
2.	Tetracycline during prednisone therapy	
3.	Potassium supplement orally	
4.	Nasogastric tube or string	
5.	Esophagoscopy 1 week	
6.	Chest x-ray weekly	
7.	"Ba swallow" at 1 month	

to the schedule shown; tetracycline was given in doses of 30 to 40 mg. per kg. per day; potassium supplement was given orally. In most instances a polyethylene nasogastric tube or a silk string was passed and left in place during the acute phase. For purposes of evaluation of the patient's course an esophagoscopy was done usually within the first week, and an examination with a "barium swallow" was done approximately one month after the burn and at frequent intervals in the ensuing months. Esophagoscopy was not done in many of the earlier patients. A chest roentgenogram was obtained at approximately weekly intervals during the treatment phase for evidence of pulmonary involvement or mediastinitis.

It will be noted that very high doses of prednisone were given at the onset in an effort to suppress the fibroblastic activity. Fourteen patients were given this full therapeutic program while 4 patients received lesser amounts for reasons of technical difficulty in administration or due to error.

The first phase of the study, therefore, consisted of the treatment (according to the above regimen) of 18 consecutive patients considered to have potential burns of the esophagus. In the second phase it was decided to initiate the above program, but to have an esophagoscopic examination done as early as practical and to discontinue the steroid therapy if this examination disclosed no burn of the esophagus. Five patients have been managed according to this program and the series is to be extended on this basis.

Results

The occurrence of stricture in the various groups is shown in table 4. Of 14 patients receiving the full course of steroids, 3 developed stricture. One of these was thought to have a normal esophagus at esophagoscopy and "barium swallow" at one month; due to the persistence of mild dysphagia the patient was restudied 7 months later and found to have an annular stricture. The second was found to have marked stricture at the end of treatment as shown by both "barium swallow" and esophagoscopy. In the third instance of stricture the patient was found to have severe burns of the esophagus when esophagoscopy was done 2 days after the ingestion, and approximately one month later was found to have stricture requiring retrograde dilation.

Of the 4 patients receiving less than optimal therapy 2 developed stricture. One of these was known to have been severely burned from the onset and developed severe stenosis; the second patient received much smaller doses of prednisone and had dysphagia within 2 weeks with eventual stenosis requiring dilation. Five patients receiving partial treatment and with negative esophagoscopy have not shown stricture.

Therefore, 5 of the 23 patients treated developed stricture. Since it is recognized that late stricture may develop, the length of follow-up of the patients should be recorded. Of the 23 patients, 12 have been observed for a period of longer than 6 months, and 11 for a shorter period than 6 months.

Discussion

Although this series represents a comparatively large experience in the treatment of such patients with steroids, it is not believed

TABLE 4

RESULTS IN TREATED PATIENTS

	Good	*Stricture*	*Total*
Treatment as outlined	11	3	14
Incomplete treatment	2	2	4
Treatment stopped after negative esophagoscopy	5	0	5
Total	18	5	23

that definite conclusions regarding the efficacy of this program can be drawn. It is obvious that steroids as administered here will not entirely prevent stricture in the severely burned patient, but based on the expected incidence of stricture from other series, it appears that the incidence of stricture is diminished. These data do not definitely confirm the excellent response reported in previous case reports and other series, but seem sufficiently encouraging to warrant pursuit of this study.

The incidence of complications attributable to the management is, of course, of great importance in assessing the value of the program. After approximately three weeks of prednisone therapy one patient developed a perforated gastric ulcer, which responded well to surgical management; this patient subsequently developed stricture. Since the ingestion of lye itself, or the presence of a weighted string in the stomach might have contributed to this, it is difficult to assess the role of the prednisone. A second severely burned patient, receiving less than optimal amounts of steroids, had an esophageal perforation following retrograde bouginage for severe strictures. A third patient developed esophageal perforation following endoscopy after approximately three weeks of prednisone therapy. All of these complications are recognized hazards of these methods of management and must seriously be considered in weighing the advantages and disadvantages of such therapy. In this series esophagoscopy was performed 24 times on 19 patients with one instance of perforation. The effect, if any, of steroids on the predisposition to perforation by instrumentation remains unknown.

Recognizing the potential hazards of therapy and weighing these against the seriousness of esophageal stricture, it is our feeling that until further data are accumulated, steroids according to the above program, should be administered when there is definite evidence of burns of the esophagus. Such evidence, however critical, is not easily obtained and it is felt that early esophagoscopy should be done and that steroid therapy should be continued only if a burn of the esophagus is visualized. It must also be recognized that even the experienced endoscopist may occasionally fail to recognize such burns. It is our plan, therefore, to continue the study on this basis in an effort to define more exactly the value of steroid therapy in the treatment of lye burns of the esophagus.

Summary

1. The results in 23 patients having ingested lye and managed by a therapeutic regimen including prednisone and tetracycline are presented. Of 14 patients receiving full treatment, 3 developed stricture; of 4 receiving less than the full program of steroids, 2 developed stricture; 5 patients started on this program with discontinuation of prednisone after negative esophagoscopy have not shown stricture.

2. Complications included a perforated gastric ulcer, and 2 instances of perforation of the esophagus.

3. This study has not conclusively established the value of prednisone in preventing stricture of the esophagus, but the results obtained are considered sufficiently encouraging to warrant pursuit of the study in patients shown by early esophagoscopy to have burns of the esophagus.

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Psychic and Somatic Changes Observed in Allergic Children After Prolonged Steroid Therapy*

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The author warns of the prolonged use of the corticosteroids in the treatment of allergic children.

EXPERIENCES OF THE PAST FEW YEARS have necessitated this critical analysis of steroid therapy in the treatment of allergic diseases.

In 1951, Glaser[1] said, "It is our opinion the steroid hormones possess a great potential for harm as well as good, and in the present state of our knowledge should be used only when absolutely necessary. The patient should be kept at all times under closest supervision." Later, in the same year, Brown[2] stated: "We do not, as yet, know the full effects of prolonged treatment with ACTH. Careful follow-up reports will be necessary before we can truly evaluate the effects of adrenocorticotropic therapy." Both essayists were well acquainted with the physiologic activity of corticotropin in the stimulation of the adrenal cortex, the substitutive value of steroid hormones, and the physiologic reactivity of the adrenal cortex. From their observations, and thousands more from all over the world, were born the indications for administration of the cortical hormones in the allergic diseases. Symptomatic relief was provided, but contraindications to this therapy were found to be evident.

In the asthmatic child, corticotropin or corticoid hormones may be employed to arrest the symptomatic crisis. The physiologic activity of the hormones is used in a rational way, though less frequently, in dermatologic forms of allergy such as urticaria and angioneurotic edema.

It has been established that corticotropin or ACTH tends to induce adrenal hyperplasia with glandular hyperfunction. Corticosteroids, however, may produce changes in the structure of the gland which may lead to atrophy of the cortex with subsequent hypofunction. A cautious use of steroids is advised. Repeated short courses are preferred and daily or continued routine administration of these preparations is thought to be ill-advised. Overfamiliarity with these products may lead one to forget their tremendous potentiality and this is especially true in pediatric practice. The day has arrived when corticosteroids are being prescribed improperly and indiscriminately to combat anorexia, to fatten a boy or to enliven a quiet girl.

Untoward Effects of Steroid Therapy

The past few years have revealed a number of side effects from even the most careful administration of ACTH or cortisone. The main complicating effects are: sodium retention and edema, potassium depletion, protein catabolism with nitrogen loss, functional adrenal cortex atrophy, gastric or duodenal ulceration and psychic alterations. The measures to avoid the physiologic alterations are: low sodium intake, potassium salts supplementation, androgen and/or estrogen hormones, high protein diet, anticholinergic and antacid drugs and ascorbic acid. Another group of so-called side effects are, themselves, actually disease entities: hyperglycemia, hypertension, hypothyroidism, activation of tuberculosis, osteoporosis, low resistance to infection, hirsutism and virilism in the female, genital hypoplasia in the male and retardation of growth. Other alterations less frequently noted are: epileptoid crises, acne, and occasionally sensitization to the hormones. Cortisone sensitivity is usually shown by

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asthma, while ACTH sensitivity assumes the form of skin manifestations.

In the presence of these groups of pathologic changes, there is no alternative but the immediate withdrawal of the hormone and a resumption of orthodox symptomatic treatment of the allergic disorder in question. The most difficult measure to undertake is the discontinuance of the hormone. This may lead to hypoplasia of the adrenal cortex (Addisonism) with resultant peripheral circulatory collapse. The only effective measure against these sequelae is the restoration of cortical function by corticotropin when indicated, or by desoxycorticosterone when advisable. If side effects do not occur, the recurrence of allergic symptoms is noted in increasing fashion after discontinuance of treatment. This has led to prolonged therapy and eventually to a dangerous condition of cortical unstability. Any physical or psychic stress could unchain an acute cortical insufficiency of the Cushing type,[3] wherein the endocrine disturbance is capable of inducing the most serious of mental deviations.

The newer corticoid derivatives, prednisone and prednisolone, are effective therapeutically in considerably smaller doses. The dramatic relief obtained with their use in most allergic symptoms may invite a complete disregard to the allergic management of the patient. The secondary effects are similar to those more frequently produced by the original preparations. The most strict adherence to low dosage will not be a warrant against the possibility of high hormonal levels in the blood. The depressing action upon the adrenal cortex induces this most feared sequel in the early stages of life, namely psychic unbalance. At any early age all deviations from normal, either somatic or psychic, are deep furrows hard to erase, especially in the allergic child.

There are several theories which attempt to explain the therapeutic action of corticotropin and corticoids in the control of allergic symptomatology. I always will refer to these agents as symptom relieving drugs, because their action upon the basic allergic mechanism is nil. Commonly, all allergic lesions take place in, or at the expense of the mucopolysaccharid gel of the connective tissue. Edema is thus the main characteristic feature. Normally, there is a state of equilibrium in the enzymatic action which builds up and breaks down hyaluronic acid. This most important of the mucopolysaccharids holds in place the cells and fibers derived from the mesenchyma. With predominance of the "breaking-down" enzyme, dispersion of hyaluronic acid occurs and edema is the resultant lesion. To its power of dispersion this enzyme owes its name,—hyaluronidase. It is always present in a bound-form in, or about connective tissue. In the allergic state hyaluronidase overbalances the "building-up" enzymes. It is believed that an excessive amount of adrenocortical hormone is required to maintain equilibrium. This theory suggests a dysfunction of the autonomic nervous and hormonal systems with a diminished production of cortical hormone. Here the anti-hyaluronidase action of corticosteroids and corticotropin demonstrates its anti-allergic activity.

There is another deviation from normal in the allergic subject. Electrolytic imbalance, at the expense of sodium, calcium and potassium, has a profound influence on the equilibrium of the autonomic nervous system. In 1932, Jimenez Diaz postulated that every critical stage of the allergic state was a paradoxic alkalosis due to the brake of the coefficient 1 to 2.47 existing between calcium and potassium. Hypercalcemia tends to sympatheticotonic states while hyperpotassemia is conducive to vagotonic conditions. It is a fact that steroid hormones deplete the tissues of potassium. It may be possible that a reduction in the potassium level of the allergic subject, who commonly is a vagotonic individual, and restoration of the electrolytic equilibrium might be responsible for the improvement in the allergic symptomatology. This is another theory, albeit a weak one!

The adrenal cortex develops from the epithelial cells in the genital tubercle, an elevation appearing in front of the cloaca at about the sixth week of embryonic life. The medulla comes from the embryonic sympathetic system. To this date, 28 steroid hormones have been isolated in crystalloid form from the adrenal cortex. They are classified in four groups depending on their activities: (1) mineralocorticoids, exemplified by desoxycorticosterone, with action on water and salt metabolism; (2) glucocorticoids, especially cortisone, with a specific action on carbohydrate metabolism; (3) androgenic corticoids,

similar to testicular androgens; and (4) estrogenic corticoids, similar or identical to follicular estrogens. We are dealing with these powerful hormones when we attempt to control indiscriminately the symptoms of the allergic child.

Bleuler[4] has asserted that prolonged therapeutic use of corticotropin and corticosteroids leads to a number of psychopathologic manifestations. It has been observed that euphoric states have been present in patients under hormone treatment. These are not long-lasting but give way promptly to prolonged depressive conditions. Euphoria has consistently been reported in about 80% of patients receiving steroid therapy. The majority of these patients present mental tension with insomnia, restless hyperactivity, ambivalence, depressed apathy, anguish with depersonalization, alertness, restlessness, incapability for concentration, fright and the most varied number of manifestations. These euphoric states are of transient character. The well-established depressive conditions persist much longer after discontinuance of therapy. Dysthymias may be induced by minimal doses of hormone with psychopathologic changes appearing at the onset, later or long after cessation of therapy.

The foregoing paragraphs indicate that adrenocorticotropin leads to hyperplasia of the adrenal cortex with a rise in the production of cortical hormones. Cushing's disease, whether of pituitary origin or of cortical character, may be reproduced by prolonged corticotropin therapy. This may be a syndrome exhibiting all the somatic and psychologic symptoms of the genuine disease. It is produced by hyperplasia of the cortex. Its somatic symptoms,[5] alarming as they may be, are unimportant compared to the psychopathologic alterations, personality changes which may actually represent true psychosis.

TABLE 1

CHILDREN OBSERVED AFTER PROLONGED STEROID THERAPY

	Cases	*Boys*	*Girls*
	55	36	19
Allergic	48	30	18
Nonallergic	7	6	1
Somatic Alterations	15	6	7
Growth arrest	9	4	5
Pubertas praecox	2	0	2
Osteoporosis	1	1	0
Metabolic disturbance	1	1	0

TABLE 2

PSYCHIC DISTURBANCES

	Cases	*Boys*	*Girls*
	34	23	11
Euphoric Dysthymias	14	10	4
Restlessness	7	5	2
Irritability	3	3	0
Premature sexual impulses	3	1	2
Homosexuality	1	1	0
Depressive States	20	13	7
Insomnia	13	8	5
Incapability for concentration	5	4	1
Apathy	2	1	1

The surprising trend toward uninterrupted hormonal therapy and the exaggerated confidence placed in the supposedly innocuous steroids have led me to present the following observations.

During the last 3 years we have studied 55 children who had been under prolonged corticoid therapy prior to our observation (Table 1). Forty-eight were definitely allergic; in 7 we could not find allergy nor other signs of disease previous to treatment with the hormones. The main complaints of these 7 children were anorexia and underweight. The allergic group had been under almost continuous hormonal therapy from 5 months to two and a half years. This effort to control their allergic symptoms had been carried out with complete disregard of any allergic, specific or other nonspecific therapy. Our first observation recorded a distinctly undersized group of 9 children (16% of the group). Growth seemed to have been arrested one to two years before, as shown by their clinical charts. Two asthmatic girls (3.6%), 7 and 11 years old respectively, showed marked hirsutism especially in the pubic area, the loins and back; the younger child presented considerable enlargement of the clitoris.

Thirty-four children (23 boys and 11 girls) from 4 to 14 years of age had been under corticoid therapy for periods ranging from 8 to 28 months (Table 2). They presented, according to their parents or relatives, definite changes in personality grouped by our psychiatrist in the following classifications.

Euphoric dispositions were observed in 14 instances, characterized by alertness, irritability, precocious sexual impulses and, in one instance, homosexuality.

Depressed conditions were present in 20

patients. It is noteworthy that these subjects had gone through a variable stage of euphoria before falling into the depressive state. Because of the close association in these psychosomatic syndromes, we have grouped the cases according to the predominant symptomatology.

I do not want to close this presentation without making reference to a most dramatic case of metabolic disturbance induced by hormonal therapy.

J. R. G., age 2½ years and weighing 35 pounds, was perfectly developed physically and mentally. His general health was good from birth to 5 weeks prior to our observation. Then, due to a skin disease (seborrhea capitis), he was placed under care of a dermatologist who diagnosed "allergic dermatosis."

After a futile attempt to clear the scalp condition with antihistamines and local treatment, oral steroid therapy was begun as 25 mg. of hydrocortisone every 6 hours for 10 days. At the end of that period the scalp condition remained unchanged, the boy had lost 3 pounds and showed signs of restlessness and uncontrollable hunger.

Treatment was changed to ACTH gel. Ten units were injected every 12 hours for one week with reduction to one daily dose for another week. At the end of 24 days of therapy the weight had decreased to 22 pounds (a loss of 12½ pounds). Intermittent convulsions appeared. Parathyrine and calcium lactate were given parenterally, and the corticotropin was changed to prednisone, 5 mg. three times a day for the following 10 days.

Thirty-four days had elapsed under one or other form of steroid therapy. The weight was now 11 pounds, a loss of 23½ pounds or 68% of his former weight. Tetanic convulsions were continuous. Serum calcium was 9.75 mg. and serum phosphorous was 4.5 mg. per 100 cc. It was then that he was placed under our care. All previous hormonal therapy was discontinued. Normal saline with vitamin D parenterally, vitamin B_1 and 25 mg. of the Collip fraction of pituitary, with a high protein and amino acid intake, were used as the only treatment.

Four weeks later he had completely recovered, had gained 13 pounds to a weight of 24 pounds. He was quite alert and his general condition was fairly good in light of his recent condition.

This case is presented as a typical picture of the massive dehydration and proteolysis associated with profound metabolic disturbances occurring in the corticorenal dysfunction.

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Discussion (Abstract)

Dr. Lawrence J. Halpin, Cedar Rapids, Ia. Dr. Estrada has wisely shown us the dangers and the inadvisability of indiscriminate use of steroid therapy. It must be remembered that there are definite times when such therapy should be used and there are definite restrictions which should be considered in any such therapeutic program. Please recall that Dr. Estrada's first act upon seeing these patients was the immediate cessation of all steroid therapy. Practically from that moment, the patients began to show improvement.

One cannot overemphasize the need for proper allergic management as opposed to the unnecessary administration of these hormones. I was impressed by Dr. Estrada's findings of euphoria and depression in these children. These changes were observed *prior* to physical alterations, and should have been recognized by their physicians as true indications for prompt withdrawal of the drugs. He has shown in these startling case reports that the phosphorous and calcium levels remained normal in the face of severe clinical signs suggestive of glandular crises.

All too often the uninterested or careless physician will attempt to relieve symptoms, allergic or otherwise, without consideration for correct and recommended procedures. Hormonal therapy, particularly in children, is radical therapy and Dr. Estrada pleads for conservatism in both principle and practice. We recognize that the greatest use of steroid therapy is found in self-limited conditions. Prolonged administration without true diagnoses and sound judgment cannot be justified. Our essayist has clearly imprinted two factors upon my mind—the need for an accurate diagnosis and the necessity for institution of a sound treatment program. These are based upon an honest regard for the welfare of the patient and a true respect for the measures used in therapy.

The Debated Indications for Vaginal Hysterectomy*

JAMES M. INGRAM, M.D., ROBERT W. WITHERS, M.D., and HENRY L. WRIGHT, M.D., *Tampa, Fla.*

Certain indications for the vaginal approach are well established. Opinions differ, however, in regard to its use in other less frequent conditions.

THE MOST FREQUENT INDICATION for vaginal hysterectomy is symptomatic pelvic relaxation. This condition, together with functional uterine bleeding resistant to treatment, and small symptomatic myomas, account for the majority of indications for vaginal hysterectomy.

At the present time the remaining minority of indications for vaginal hysterectomy is providing the most interest, and at times dispute, among gynecologists. The acceptance of these various minority indications varies from place to place and from year to year. They cannot be called "borderline indications" because they are completely accepted by some and vigorously rejected by others. The purpose of this discussion is to examine and evaluate these debated indications for vaginal hysterectomy.

Intra-epithelial Carcinoma of the Cervix

Though some[1] still prefer to treat intra-epithelial carcinoma by a modified Wertheim hysterectomy, most employ simple total hysterectomy with preservation of one or both ovaries. When this stage of carcinoma was first recognized generally in 1942, abdominal hysterectomy was universally preferred. More recently vaginal hysterectomy has been found to have an equally high rate of cure and a lower operative mortality. The histologic integrity of the cervix can be preserved for study by using heavy silk traction sutures instead of the tenaculum. Many patients with this disease are multiparas who need vaginal repair. This can be done easily after vaginal hysterectomy. We, as well as many others,[2-4] consider vaginal hysterectomy the better operation for noninvasive carcinoma.

Endometrial Carcinoma

The preferred operation for endometrial carcinoma remains abdominal hysterectomy, with or without radiation, according to the operator. However, in such competent clinics as that of Dalhousie Medical School in Halifax, the staff has treated large groups of patients by vaginal hysterectomy and bilateral salpingo-oophorectomy with good results. Vaginal hysterectomy has been used to treat endometrial carcinoma since 1920.[5] Preoperative radium or x-ray does not preclude vaginal hysterectomy.

We reserve vaginal hysterectomy in this disease for poorer operative risks, such as the obese diabetic, severe cardiac, or elderly debilitated woman. For them vaginal hysterectomy is rapid and well tolerated. The opportunity of abdominal gland dissection or resection of distant abdominal metastases can be more readily surrendered in these patients. However, these advantages should not be denied a patient of average operative risk.

Symptomatic Retroversion

While anatomic retroversion of the uterus is common, symptomatic retroversion is rare. It is becoming even more rare as gynecologists are better trained. Even so, in certain parts of the South surveyed by Diddle,[6] suspension of the uterus was still the most frequent pelvic operation.

Except for patients whose future childbearing is desired, hysteropexy is usually accompanied by tubal sterilization. The patient is left with a sterile uterus subject to benign and malignant disease, a suspension procedure which frequently fails, and a tubal sterilization which may recanalize. We propose that vaginal hysterectomy avoids these disadvan-

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tages and easily accomplishes a permanent result.

Resistant Cervical Erosion

Occasionally, all measures, including multiple biopsy, cauterization, local application, douches and systemic chemotherapy fail to clear up erosion. The relationship between erosion and subsequent carcinoma can be debated, but the discomfort of leukorrhea and constant contact bleeding cannot. In such patients we prefer vaginal hysterectomy to trachelorrhaphy and sterilization. The latter procedure subjects the patient to more frequent secondary bleeding and later to cervical stenosis; and it again leaves a sterile, useless uterus.

As has been pointed out before, one must know clearly the attitude of the patient toward hysterectomy before he chooses it over a procedure which would preserve menstrual function. In some few women the uterus holds unalterable psychosexual importance. They will readily accept some risk or even later hysterectomy in order to preserve the uterus. Hysterectomy should not be forced upon them.

Sterilization by Vaginal Hysterectomy

Four years ago Thomas[7] presented in Miami the proposal that sterilization itself was better accomplished by vaginal hysterectomy, three or more months postpartum, than by puerperal tubal resection. This proposal initiated a heated and vigorous discussion. Yet, among its stoutest opponents, it provided much serious thought and some converts.

Since then, vaginal hysterectomy, in well-trained hands has proved to be an even safer procedure than was formerly reported. Counseller,[8] at the Mayo Clinic, reported one death in 2,867 vaginal hysterectomies and no deaths since 1948. These, and other equally encouraging results indicate that the difference in safety between puerperal sterilization and vaginal hysterectomy, if any, is small.

Certainly the amount of surgery performed in the two procedures cannot be compared. It is the widely different circumstances under which the two are done that makes them comparable in safety and desirability.

Puerperal sterilization is an abdominal celiotomy under general anesthesia which follows by only a few hours or days a labor, delivery and previous anesthesia. The two procedures and anesthesias in a short period make no small demand on the patient. This elective operation is done when the pelvic veins are enlarged and much more susceptible to phlebitis and embolism. Postpartum anemia, if present, must be corrected by transfusion. As in the other sterilizing procedures, a useless, sterile uterus results. Puerperal sterilization is done during the first and most hazardous hour of the baby's life, when the chance of sudden and unpredictable neonatal death is the highest. Puerperal sterilization is less certain than hysterectomy.

Puerperal sterilization has several advantages. It is a smaller operative procedure, which, for the patient, can be done conveniently and cheaply on the same admission as delivery. It preserves menstrual function for those who desire it. There is probably less chance of disturbance of ovarian blood supply.

Vaginal hysterectomy, done three or more months postpartum, offers these advantages. It is done when the mother has recovered completely from delivery. The pelvic veins and viscera have resumed normal size. Anemia is better corrected by diet and iron. Pelvic relaxation can be evaluated and corrected. The uterus is removed and is no longer subject to benign or malignant disease. The child has passed the neonatal period and the parents have a much greater assurance of a family of their desired size. The care of a child of three or more months is easier when the mother returns home. The mother does not face the feeding problem and nocturnal habits of the newborn. Permanent sterilization is more certain than with tubal resection.

We are by no means ready to abandon totally puerperal sterilization in favor of vaginal hysterectomy. However, because of these obvious and important advantages, we are using vaginal hysterectomy more frequently than before.

When puerperal sterilization appeared in the literature a number of years ago, it was greeted first with horror, then with interest and finally, in just a few years, with enthusiasm. One must consider: Is sterilization by vaginal hysterectomy following the same path?

Young Multiparas with Relaxation

A problem of management is occasionally

presented by a woman in her mid or late twenties who has four or more children and definite symptomatic relaxation. In spite of gross and symptomatic anatomic distortion, every attempt should be made to delay operation in such young women. The Kegel perineometer and vaginal exercises will be helpful to many. But some will retain symptoms and will require surgical treatment, particularly those who must perform all their housekeeping, or work outside the home. The use of the Manchester operation for younger women has been unsuccessful in our hands. The results of vaginal hysterectomy and repair, after careful explanation to the patient, have been much better. When busy with a large family or earning a living, these women have little time to dwell on the psychic importance of the uterus.

Myomas Requiring Morcellation

Morcellation has been debated since the Germans popularized vaginal hysterectomy at about the turn of the century. The argument is now reduced to a matter of individual preference and skill. Many excellent gynecologists employ morcellation frequently and well. We are only too happy to do an easier abdominal hysterectomy and admit that they are more skillful at morcellation than we.

Summary

The majority of indications for vaginal hysterectomy is clearly defined and generally accepted. The minority indications, those less frequent and more debated, have been discussed and their advantages and disadvantages examined. Vaginal hysterectomy is not presented as a surgical pelvic panacea. However, because of its relative safety and wide adaptability, its increased use is advocated.

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Discussion (Abstract)

Dr. Buford Word, Birmingham, Ala. In reviewing the provocative paper we have just heard Dr. Ingram present, I was reminded of a story in Irving Stone's "Clarence Darrow for the Defense." Mr. Darrow was addressing the inmates of the Illinois State Penitentiary. He said, in effect, the gates of this prison should be opened and all of you men should walk out of here free. It is not your fault you are confined in this prison. It is the fault of society for not having provided a better environment for you. Had society done its duty you would not have committed the crimes that resulted in your being here. You should all be freed, now. A news reporter in the audience asked one hardened criminal what he thought of Mr. Darrow's remarks. The man replied, "He's too radical."

On January 12, 1861, Dr. Samuel Choppin of New Orleans did the first vaginal hysterectomy for uncomplicated uterine prolapse on 38 year old Jane Arnous. (*Southern Journal of the Medical Sciences* 1:622, 1866) Vaginal hysterectomy had been done earlier, by Recamier and others, for carcinoma of the cervix and inversion of the uterus. However, Choppin was the first to do a planned vaginal hysterectomy for simple uterine prolapse. He had previously attempted a conservative procedure of narrowing the vagina to correct the prolapse and only after that proved unsuccessful did he resort to hysterectomy. In his words. "The uterus, the left fallopian tube and the left ovary were successfully extirpated and the patient radically cured." The operation was done by elevating mucosal vaginal flaps and amputating the uterus from its peritoneal attachments by means of an ecraseur which controlled the bleeding. The patient made an uneventful recovery and on February 19th she was presented in a clinical lecture to the class of the New Orleans School of Medicine holding her womb in her hand to demonstrate the uterus could be removed without causing death.

What today is a conservative indication for vaginal hysterectomy, 96 years ago was termed radical. This causes one to wonder if, 96 years from now, all of the indications listed by Drs. Ingram, Withers and Wright will be accepted as conservative indications. Personally, I have my doubts.

An analysis of my most recent 138 private hysterectomy cases revealed that 70 were done by the vaginal approach and 68 abdominally. Most of the vaginal procedures were done for generally accepted indications. However, one or two were for each of the following debated indications: carcinoma *in situ*, symptomatic retroversion, sterilization and fibroids requiring morcellation. I have not done a vaginal hysterectomy for endometrial carcinoma, for resistant cervical erosion, or on a young multipara with relaxation.

All major technical difficulties encountered in performing vaginal hysterectomy, in my meager experience, occurred in patients with debated indications. On four occasions hysterectomy was begun vaginally but was completed abdominally, or the abdomen

opened to control actual or suspected hemorrhage. In retrospect, in these four instances, abdominal hysterectomy would have been the better initial choice. The decision to perform vaginal hysterectomy should be made only after careful evaluation of each individual patient. The organic lesion indicating hysterectomy is not in itself, in my opinion, the most important consideration in selecting the vaginal approach. Certainly, every patient with carcinoma *in situ* is not a candidate for vaginal hysterectomy and neither are all patients with a desire for sterilization.

In the hands of Drs. Ingram, Withers and Wright I am sure vaginal hysterectomy is a safe procedure for all of the debated indications enumerated by Dr. Ingram. There are many instances in which organic disease in the uterus dictates hysterectomy, but the route of its removal is optional. In such cases the patient's best interest will be served if the surgeon selects the procedure at which he is most adept.

Vaginal hysterectomy has many advantages when done by an experienced and skilled operator. However, it is my opinion that if all who are currently doing hysterectomies routinely employ the vaginal approach for the debated indications mentioned this morning, there will be an appreciable increase in morbidity and even mortality.

Radial Nerve Injuries*

J. LEONARD GOLDNER, M.D., and
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The physician when confronted with a radial nerve injury should have an over-all plan for handling the various phases of treatment.

INJURY TO THE RADIAL NERVE is of interest to surgeons handling trauma because this nerve injury is frequently associated with fracture of the humerus or severe soft tissue injuries of the arm. Radial nerve paralyses comprise approximately 19% of all peripheral nerve injuries and are the most common nerve injuries associated with fracture.[1,2] Gurdjian[3] points out that this is easily understood when one considers that the radial nerve, through at least a third of its course, is in apposition to bone.

In 1952, Sunderland[4] classified peripheral nerve injuries using the degree of injury to differentiate five categories. *First degree* injuries are those in which the nerve at exploration appears to be in continuity, but the muscles it supplies are paralyzed. In this group, signs of recovery should occur within 4 weeks and recovery should be complete within 3 to 6 months. Since wallerian degeneration does not occur in this group, recovery does not progress distally in an orderly fashion, but in a simultaneously diffuse and frequently spontaneous manner.[5]

In *second degree* injuries the continuity of the axons is actually destroyed or interrupted, but the endoneurial tubules and the pattern of internal structure of the nerve are unchanged. Wallerian degeneration occurs, and the regenerating axon advances distally in the tubule it originally occupied and complete recovery may be expected. This axonal regeneration requires more time for recovery than in a first degree injury. The progress of sensory recovery is indicated by the distal advance of Tinel's sign.

In *third degree* injuries there is more extensive internal disorganization of the nerve funiculi and rupture of endoneurial tubules. Because of endoneurial fibrosis and because of faulty reinnervation, regeneration progresses more slowly than in second degree injuries and recovery is likely to be incomplete.

In *fourth* and *fifth degree* injuries there is more complete disruption of the internal structures of the nerve and of continuity. Prognosis for recovery without nerve suture is poor.

Between the years 1934 and 1954, 220 patients with radial nerve paralysis resulting from many causes were seen at Duke Medical Center. Only 63 of these patients had definitive treatment, or were followed for a long enough period to be included in this review. The remaining cases were omitted because they were seen in consultation only, or because of insufficient records and follow-up examinations. All patients in whom the radial nerve was explored at Duke Hospital, and two explored elsewhere, are included in this study.

This analysis of radial nerve injury was made to compare the experience at Duke Hospital with published evidence and to study the varied characteristics of such injuries. Because of the method of selection of patients and because more than half of the patients finally operated on were referred to Duke after initial treatment elsewhere, this study does not represent a statistical series, nor does it necessarily represent the standard treatment of radial nerve injuries at Duke Hospital.

Mechanisms of Injury

1. *Fractures and Dislocations.* (Table 1)

Thirty-four (54%) of the 63 patients had a fracture of the humerus associated with radial paralysis. Nine of the 34 had no operative treatment and 8 of these recovered spontane-

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TABLE 1

MECHANISM OF INJURY: FRACTURES AND DISLOCATIONS

Mechanism of Injury	*Number of Patients*	*No Operative Treatment*	*Operative Treatment*
Fractured humerus	34	9	25
Fractured radius and ulna	3	1	2
Dislocated shoulder	1	1	
Dislocated radial head	1		1
Total	39	11	28

ously. The ninth had associated severe injury of soft tissues by a shotgun injury; during the follow-up of only 4 months no signs of returning function appeared.

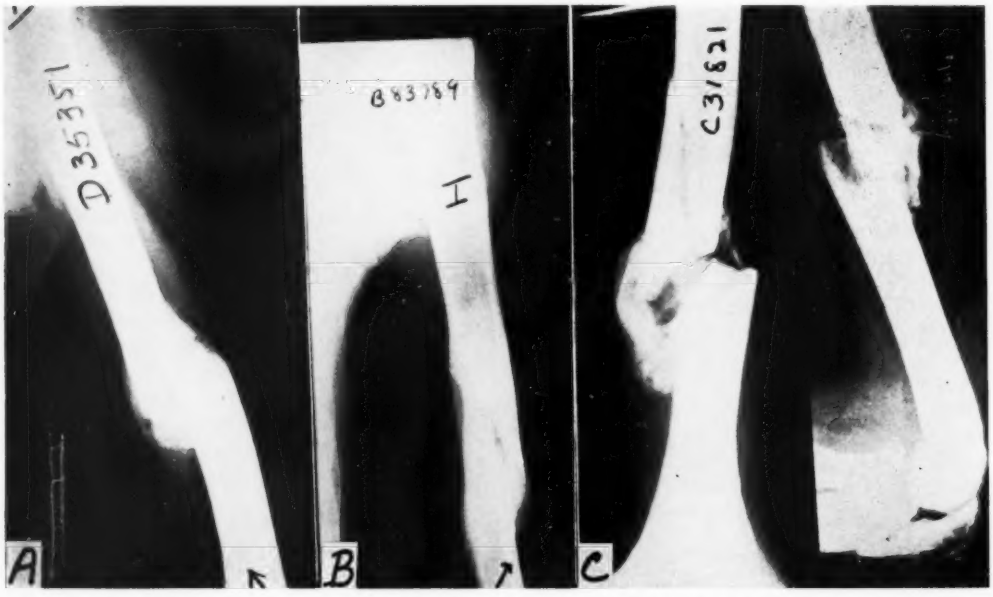
Twenty-five of the 34 patients were operated upon. Thirteen of these regained satisfactory functional recovery without tendon transfers. Of the remaining 12 patients, 4 had tendon transfers, 4 declined such an operation and 4 failed to return for follow-up after nerve surgery.

Only one patient in the entire group of 34 had a fracture in the proximal one-third of the humerus. Fifteen fractures occurred in the middle third and 18 in the distal third. The roentgenograms of all patients with fractures of the humerus and radial nerve damage have been reviewed and no correlation could be found between the degree of nerve damage and the characteristics of the fracture itself (Fig. 1, A, B and C). The degree of soft tissue damage frequently did correspond to the degree of nerve damage, but even this observation was not consistent.

Fractures of the radius and ulna with resulting paralysis occurred in 3 patients. One recovered spontaneously within 266 days (38 wks.). Two were explored elsewhere; one had an intact nerve, the other had a completely severed radial nerve which was irreparable. Neither recovered and both declined further surgical treatment.

Dislocation of the shoulder accounted for radial palsy in one patient whose muscles recovered without operative treatment within 178 days (25 wks.). One patient was seen two years after dislocation of the radial head with radial nerve paralysis. Exploration revealed scarring of the superficial branch of the nerve and complete severance of the deep branch with neuromas. The nerve was considered ir-

FIG. 1



Fractures of the humerus with and without radial nerve injury cannot be correlated by the roentgenogram. (A) The patient with this fracture had immediate paralysis of radial nerve muscles with spontaneous recovery beginning at 5 mos. (B) There was complete severance of the radial nerve which required nerve suture. (C) There was no injury to the radial nerve and no muscle deficit in spite of the displacement, the large callous and the location of the fracture.

reparable and no further surgical treatment was done.

2. *Miscellaneous Causes of Radial Nerve Injury.* (Table 2)

(A) *Crush and Contusion.* Crush injuries and contusions without fractures were the cause of nerve injury in 5 patients. Four of these received no operative treatment. Two averaged 267 days (38 wks.) to attain functional recovery and 2 failed to return for planned operative treatment after showing no signs of return of muscle function. One of the 5 was found at operation to have an irreparable 4.5 cm. defect with neuromas. Subsequent tendon transfers afforded a functional hand.

(B) *Pressure, Ischemia and Stretch.* Pressure, ischemia and stretch as causes of radial nerve injury include such trauma as the following: Three patients with "Saturday night palsy," one with tourniquet palsy, one with postoperative stretch palsy, one with paralysis from an enlarging lipoma, one with paralysis from an enlarging aneurysm and 2 paralyses following operations on the humerus (osteotomy for nonunion and excision of an osteoma). Eight of the 9 patients in this group are known to have recovered completely without nerve suture or neurolysis. The patient with the lipoma failed to return for examination after excision; however, the nerve appeared undamaged at the time of operation.

(C) *Bullets and Shotgun Pellets.* Three patients sustained soft tissue wounds from bullets and shotgun pellets. One recovered spontaneously without operative treatment within 51 days (7 wks.). One was explored and the nerve found intact with a neuroma in continuity and failed to return for follow-up after operation. The third had neurolysis 5 months (21 wks.) after the injury and attained complete recovery, except for mild weakness of all muscles innervated by the radial nerve, 130 days after operation.

(D) *Lacerations and Stab Wounds.* Various lacerations and stab wounds caused radial paralysis in 7 patients. Two recovered completely without operation in an average time of 182 days (26 wks.). One patient, whose arm was explored and found to have an undamaged nerve, failed to return for follow-up. The remaining 4 patients required nerve suture for completely severed nerves. Three recovered function after suture; the fourth had considerable soft tissue damage in addition to severance of the dorsal interosseous nerve, and despite suture, regained no function of this nerve.

TABLE 2

MECHANISM OF INJURY: MISCELLANEOUS

Mechanism of Injury	*Number of Patients*	*No Operative Treatment*	*Operative Treatment*
Crush and contusion	5	4	1
Pressure, ischemia or stretch	9	6	3
Bullets and shotgun pellets	3	1	2
Lacerations and stab wounds	7	2	5
Total	24	13	11

Evidence for Nerve Regeneration

In a monograph published in 1918, Tinel[6] first described his nerve percussion sign as a means of predicting prognosis in nerve injuries. He stated that, "The presence of formication paresthesia provoked by pressure below the nerve lesion warrants our affirming that there is more or less complete regeneration." He further qualified this by saying, "Formication is the best and almost the only sign of regeneration of the nerve; for not only does it enable us to follow the progress of regeneration, but through its intensity, rapidity of migration, and the region in which it appears, it even supplies exact information regarding the quality, extent, or limitation of regeneration."

In most of the cases in this review, Tinel's sign was found to be a valuable aid in determining the progress of regeneration; however, it must be emphasized that the sign is not completely specific. The quality, extent or limitation of motor regeneration cannot be determined by this sign. It will serve as an indication of sensory regeneration. Tinel's sign must be augmented by periodic testing of function of the involved muscles to ascertain motor recovery. An advancing Tinel's sign is indicative of sensory regeneration, but the mere presence of paresthesias distal to a stationary Tinel's sign cannot be interpreted as sensory regeneration since paresthesias in an absent extremity (phantom pain) can be frequently produced by percussion of a neuroma in an amputation stump, implying the presence of a cortical sensory image.

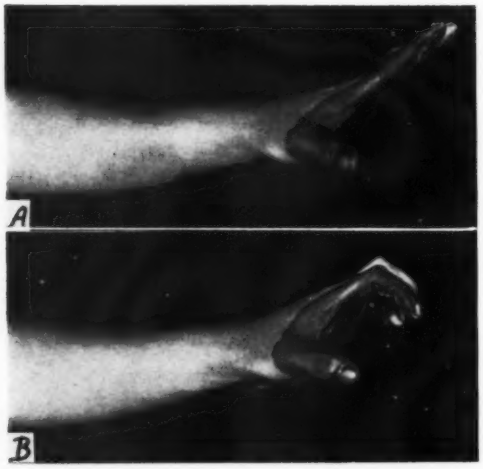
Tinel's sign is a satisfactory but inconclu-

sive method of estimating the degree of nerve damage in closed fractures of the humerus, and of determining the advisability of opening such a fracture if associated with radial nerve paralysis. The presence or absence of advancing percussion paresthesia initially, at 2 weeks, and again at 6 weeks after injury, will serve as a guide for exploration of the radial nerve. After a reasonable waiting time (6 to 8 weeks), if there is no sign of advancement of Tinel's sign, operative intervention should be considered to determine the status of the radial nerve. The rate of advancement of Tinel's sign and the rate of motor recovery will vary with the individual patient depending upon the location of the lesion and the degree of nerve injury. These variables necessitate an individual decision for each patient.

Electromyography will add to our information about the potency of the neuromuscular unit.

A waiting period of 4 to 6 weeks is considered optimum because a first degree nerve injury will show signs of sensory and motor recovery within 6 weeks. If a second degree injury has occurred, a detectable advance of Tinel's sign should be apparent within 6 to 8 weeks, enough time to permit contiguous surgery without risk of impairing bone union. If there is evidence of sensory regeneration, a longer waiting period could not be severely criticized, because some of the patients in this group recovered completely without sign of motor recovery for 20 weeks (Fig. 2, A and B). Prolonged waiting, without any evidence of regeneration is not justified since this allows the distal nerve time to become fibrotic and permits degeneration of the motor end plate.

FIG. 2



There was complete paralysis of muscles supplied by the radial nerve following fracture of the humerus. Exploration was planned for 12 wks. but, because of illness, was not possible. At 20 wks. there was evidence of beginning muscle recovery. (A) Represents full finger, thumb and wrist extension. (B) Shows ability to elevate the wrist without using full strength of finger extensors; a sensory deficit persisted. It is usually not desirable to wait 5 or 6 mos. for exploration of the nerve unless there is indirect evidence of nerve regeneration.

TABLE 3

EVALUATION OF TREATMENT: NONOPERATIVE TREATMENT (25 PATIENTS)

Number of Patients	*Recovery Rating in Per Cent*	*Time Onset to First Sign Motor Recovery (In Days)*	*Total Time Onset to Final Recovery (In Days)*
3	100	Unknown	67
2	100	67	122
6	100	53	169
2	100	55	256
1	100	182	911
2	90	44	227
3	75	122	271
2	50	Unknown	254
1	0	No return after five years	
3		No follow-up	

Evaluation of Treatment

Nonoperative Treatment. (Table 3) In 25 of the 63 patients no operations were done. Fourteen patients recovered completely and 7 recovered partially. Of the remaining 4 patients, one showed no sign of recovery when seen again 5 years after initial examination, and 3 failed to return for follow-up study after initial examination. The time from the onset of paralysis to the first sign of motor recovery ranged from 6 to 182 days (26 wks.) with an average time of 78 days (11 wks.). The time from the onset to complete or maximal recovery ranged from 51 days (7 wks.) to 367 days (1 yr.). The average time was 177 days (24 wks.).

Operative Treatment. (Table 4) Thirty-eight of the 63 patients were operated upon.

1. *Exploration without Neurolysis.* The radial nerve was explored in 12 patients. In 5 of these, the severed nerve was considered irreparable because of the length of the defect. Tendon transfers were done in 2 patients with satisfactory function resulting, while 3 patients refused further surgical management.

Of the remaining 7 patients, an intact nerve was found in all. Two recovered completely within 10 weeks, a third was not seen for two

TABLE 4

OPERATIVE TREATMENT

Operation	*Nerve Suture Impossible*	*Nerve Intact*	*Nerve in Fracture Site*	*Time Observed Prior to Operation*	*Functional Recovery without Tendon Transfer*	*Functional Recovery with Tendon Transfer*	*No Additional Treatment Desired by Patient*	*No Follow-Up*
Exploration 12 patients	5	7	1	0-6 mos.	3	3	3	3
Neurolysis 9 patients		9	1	2 wks.-6 mos.	6			3
Nerve suture 17 patients		2	2	0-16 mos.	9	3	5	

and one-half years and his muscle function had recovered completely, and 3 others did not return for examination following the exploration. One patient had tendon transfer with a good functional result after there had been no improvement following the exploration.

2. *Neurolysis.* This was done in 9 patients. Eight of these had fracture of the humerus with scarring and fibrosis at the fracture site. In one the nerve was caught between the fracture fragments. Three had a neuroma in continuity, but because of response to stimulation resection was not done. The ninth patient had a band of constricting scar around the intact radial nerve as a result of a bullet wound.

Five of the 9 patients recovered 75 to 90% of useful function. The time from operation to recovery ranged from 47 days to 19 months. Another patient was not seen until almost 7 years after neurolysis, at which time he had normal function of all muscles. The remaining 3 patients failed to return for follow-up study, and nothing is known of their recovery.

Three of the patients with good motor recovery obtained this within the length of time physiologic recovery could be expected without neurolysis. *Whether or not neurolysis was beneficial cannot be determined from this group of patients.* One patient did show regression of motor power, which ceased and changed to improvement in motor power following neurolysis. In this particular instance, the procedure seemed to be of value.

Seven of the 9 patients in this group were observed at least 3 months prior to surgery. Of the remaining 2, one was operated upon one month following a supracondylar fracture, and the other was explored only 2 weeks after a fracture of the distal shaft of the humerus because of inability to reduce the fracture. In this instance, the nerve was found in the fracture site.

3. *Nerve Suture.* Seventeen patients of the entire group required nerve suture. Twelve of these had fractures (11 nerves had been completely severed and one had a nonconducting neuroma in continuity), 3 had severe lacerations, one had a stab wound and one was crushed in a cotton hopper. Complete severance of the nerve was observed in 15 of these patients. The nerves damaged by fracture were all involved in scar formation near the fracture site, but only two nerves were actually caught between the fracture fragments.

Nine patients achieved a functional hand following nerve suture, and 4 of these were classified as having complete recovery. The period of time from nerve suture to maximal recovery of motor function ranged from 15 to 100 weeks. This variation depended on the site and extent of injury, adequacy of suture and duration of time from the initial injury to suture.

Eight of the 17 patients did not obtain a satisfactory result following nerve suture. Three of these 8 showed some degree of recovery though not sufficient for adequate function; therefore tendon transfer was done to improve the use of the hand. The remaining 5 patients showed no muscle recovery following nerve suture. They were observed for from three and one-half to 18 months after surgery. Factors which were noted to account for failure to obtain motor recovery were: (1) a large defect with inadequate suture; (2) large defects requiring humeral shortening one year after original injury, with inadequate suture; and (3) infection and/or osteomyelitis prior to nerve suture. None of the five desired tendon surgery.

4. *Shortening of the Humerus for Radial Nerve Suture.* Shortening of the humerus to

permit suture of the severed radial nerve in the event of a long defect is a useful procedure. This particular bone operation may be done early in conjunction with internal fixation of a fracture which has not yet united completely, on a humerus which has a frank nonunion, or on an intact humerus. If nerve suture is necessary and the humerus is not united, it is probably advisable to carry out intramedullary fixation at the same time the nerve suture is done. Platt,[7] in 1921, pointed out that an ununited fracture contiguous to a sutured nerve may retard or prevent recovery because of tension and friction at the suture site due to bone motion.

Massie and Ecker,[8] in 1947, reported 8 cases

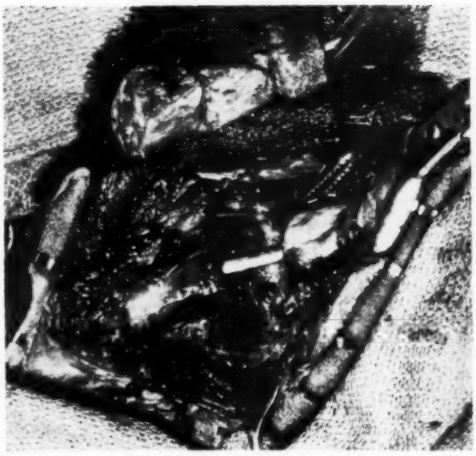
FIG 3, A

(A-D Compound fracture of the humerus with complete severance of the radial nerve.) Ten days following injury delayed primary closure accomplished by rotation of local skin flap. Fracture partially immobilized by cast and traction during healing phase.

FIG 3, B

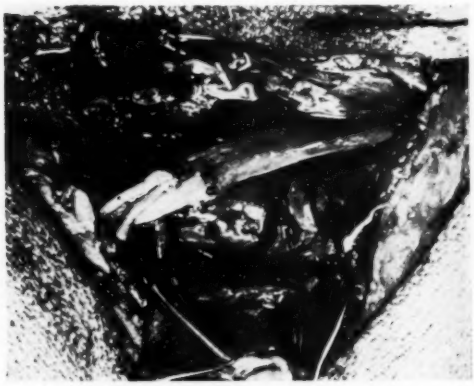
Five weeks following injury wound is healed; nerve suture and humeral shortening are planned.

FIG. 3, C



Six cm. gap in the nerve required 6 cm. shortening of the humerus. Fixation of fracture obtained by intramedullary Rush nail.

FIG. 3, D



Adequate nerve suture obtained following shortening of the humerus. Triceps muscle pulled in between humerus and nerve. Gelfoam around nerve suture; 90% motor function returned.

of humeral shortening and neurorrhaphy with incomplete follow-up studies. The Duke series has 4 instances of humeral shortening done at the time of radial nerve repair. One patient was a 12 year old girl, who had had a compound fracture from a gunshot wound. Osteomyelitis and nonunion had occurred, and it was 12 months before definitive surgery could be done. Humeral shortening and bone grafting were necessary in order to bring the radial nerve segments together, but even with this an inadequate suture was obtained because of the large circumference of the proxi-

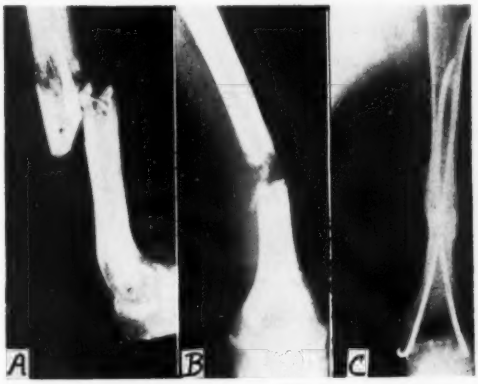
mal segment, and the small size, as well as fibrosis, of the distal segment. Union of the humerus occurred but there was no recovery of motor function. The second patient was an adult with a complete brachioplexus stretch paralysis and long oblique fracture of the humerus in the distal third. Union of the fracture occurred, and after several months there was partial recovery in the median and ulnar nerve segments, but no recovery of the radial nerve muscles. At exploration the nerve was found to be severed, and because of fibrosis a large defect was present. Humeral shortening was done, but again an unsatisfactory suture was obtained, and there was no motor recovery.

The third case was an 18 year old man, who received a compound fracture of the humerus and complete laceration of the radial nerve (Fig. 3, A-D). Fourteen weeks following the injury it was possible to isolate the nerve segments; it was necessary to shorten the humerus 6 cm. to overcome a 6 cm. gap in the radial nerve. This patient showed excellent motor recovery with strength about 90% of normal. The fourth patient was a 30 year old man who had a compound, comminuted fracture of the humerus with immediate paralysis of the radial nerve following an automobile accident. Initial treatment had included excision of the wound and partial closure of the wound followed by plaster immobilization. When first seen at the Duke clinic, he showed all the signs of a chronic osteomyelitis with a large sequestrum of a segmental fragment. About 4 months following the original injury the area was opened widely, all dead bone removed, and the wound allowed to granulate. The radial nerve was not seen at the time of this operation. The wound closed after several weeks of immobilization, and partial recovery of function in the wrist extensors became evident. After drainage had ceased for approximately 3 months, the wound was reopened, two intramedullary Rush nails were inserted and iliac bone was added to the site of nonunion. The radial nerve was not explored because of the extensive amount of fibrosis present. Union of the fracture occurred and there was recovery of motor power to the extent that the fingers, wrist and thumb reached the strength of about 70% of normal (Fig. 4).

If a symmetrical uniform nerve suture is not possible, humeral shortening is probably not advisable. The exact time for the surgeon to consider exploration of the radial nerve is suggested by observations in this series, but the decision cannot be absolute. Immediate exploration is of questionable value. If this is done and the nerve is severed, the accuracy of suture, if done at the time of this initial exploration, is uncertain. If the nerve is found to be damaged, but in continuity, it may be necessary at 8 to 12 weeks to operate again to determine whether or not a neuroma has formed. Resection of a neuroma is not an easy decision to make at this early stage (6 to 12 wks.) because adequate motor function does occur even in the presence of a firm lesion. Additional delay for 5 to 6 months, moreover, will reduce the possibility of excellent motor recovery. Each patient presents a special problem and the experience of the surgeon, rather than statistics, will be the most important factor in determining the final treatment.

In this series, 29 of the 38 patients operated upon were observed for at least 3 months prior to surgery. Table 4 indicates the appearance of the nerve, treatment carried out, and the end result. Of the remaining 9 patients, 2 had nerve suture at the time of open reduction of the fractured humerus on the day of injury (neither one done at Duke) and both failed to regain motor function. Another patient had immediate nerve suture at the time of excision of the wound on the day of injury,

FIG. 4



Patient had compound fracture with subsequent osteomyelitis and radial nerve injury. (A) Sequestrum removed in order to control infection; nerve not explored. (B) Drainage ceased after 3 mos. and there was evidence of spontaneous nerve recovery. (C) Four mos. after drainage had ceased and 7 mos. after original injury, intramedullary nails inserted and bone graft added. Union took place; motor recovery of radial nerve muscles reached 70% of normal.

FIG. 5, A

(A-C Severe crushing injury by heavy roller caused fracture of the humerus and injury to the radial nerve with complete muscle paralysis.) Exploration of the nerve showed extensive damage extending from just above the elbow to the midarm region. Resection was not possible; motor recovery did not occur.

and a fourth patient had nerve suture two and one-half weeks following injury. The former regained no muscle function, and the latter recovered about 40% of normal muscle function within 5 months of operation. In another instance exploration was carried out 5 weeks after fracture and radial nerve paralysis, and a large hematoma was evacuated with eventual good motor recovery. Possibly the hematoma played a part in nerve compression.

Inability to obtain reduction of the fractured humerus occurred in 2 patients who had radial nerve paralysis, and exploration was done at 2 and 5 weeks respectively. The nerve was found in the fracture site in one of these but not in the other. The nerve prevented reduction in one instance and interposed muscle and fascia in the other.

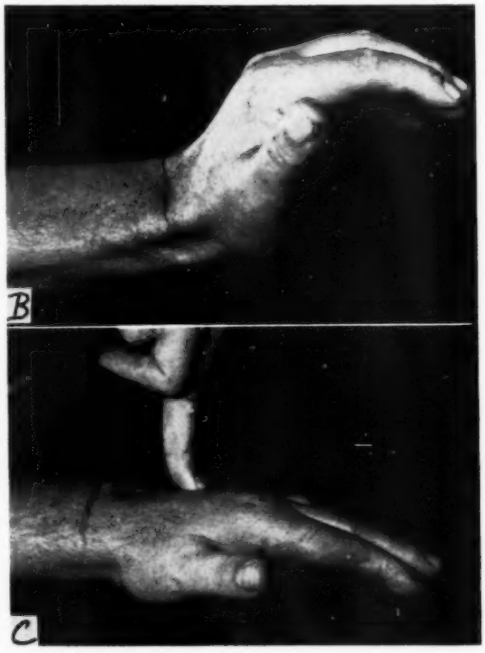
Tendon Transfer for Partial or Complete Paralysis of Extensor Muscles Following Nerve Injury

The possibility of tendon transfer procedures should be included in the over-all plan of treatment whenever a radial nerve injury is encountered. The procedure is of great value when an irreparable nerve lesion is present. Complete paralysis of the thumb extensor muscles, the finger extensors and the wrist extensors requires use of all muscles available without sacrificing adequate stabilizing strength of wrist flexion. It is desirable, if possible, to leave either the flexor carpi radialis or the palmaris longus as a wrist flexor, to stabilize grasp.

Extension and partial external rotation of the thumb may be replaced by severing and re-routing the extensor pollicis longus tendon from the dorsum of the wrist to the radial side and suturing it to either the flexor carpi radialis or the flexor digitorum sublimis of the ring or long finger.[8,9] Any of these motors, placed under adequate tension, will allow active abduction and partial external rotation, and will stabilize the thumb for opposition. It is usually not necessary to put a separate motor into the abductor pollicis longus or extensor pollicis brevis.

The flexor carpi ulnaris may be utilized for replacing the paralyzed extensor digitorum communis. The distal end of the tendon and its muscle can be passed over the ulnar border of the forearm just distal to the ulnar styloid.

FIG. 5, B and C



(B) Seven mos. following original injury, tendon transfer procedures were done utilizing flexor carpi radialis to the rerouted extensor pollicis longus. This was done in 1951; a year later there was active extension of the thumb with partial external rotation and excellent strength. The tendon transfer can be readily seen. The flexor carpi ulnaris has been transferred around the ulnar border of the wrist, the dorsal carpal ligament severed, and the tendon inserted into the extensor digitorum communis in the region of the base of the metacarpals. (C) Successful wrist and finger extension resulted. The pronator teres was inserted into the extensor carpi radialis brevis.

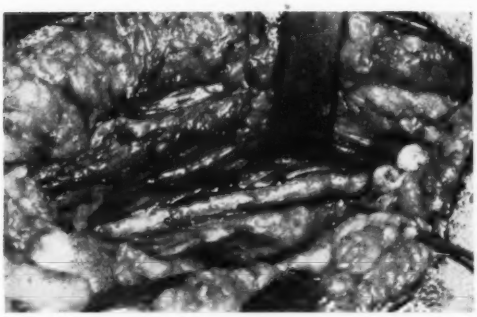
The dorsal carpal ligament should be severed and the flexor carpi ulnaris inserted into the common extensor tendons, maintaining the digits under the proper tension. This flexor muscle may be somewhat short and may require a small tendon graft at the time of transfer. An alternative method is to pass the flexor ulnaris through the interosseous membrane. The transferred tendon can then be inserted into the extensor tendons as far distally as possible. The strength of the finger extensors seems to be better if the dorsal carpal ligament is severed and the flexor ulnaris sutured into the finger tendons distal to the wrist joint (Fig. 5, A-C).

The flexor digitorum sublimis tendons of both the long and ring fingers should be utilized to aid in attaining either thumb or finger extension, particularly if the flexor carpi radialis is left in place for stabilization of wrist flexion. The pronator radii teres, if not damaged by previous injury, should be transferred to the musculotendinous junction of the extensor carpi radialis brevis in order to strengthen wrist extension.

Regeneration of the radial nerve may allow only partial recovery of the extensor muscles. In that case, one wrist flexor or both sublimi may be used wherever necessary, in order to complement the partial motor recovery which has occurred in the wrist, finger and thumb extensors (Fig. 6, A-C).

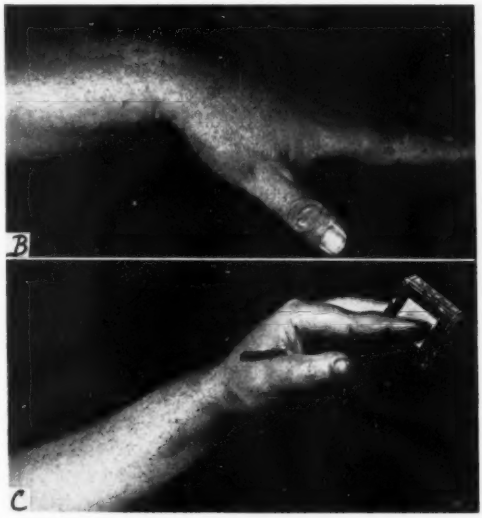
The length of time allowed to elapse from radial nerve injury to tendon transfer procedure depends on the nature of the original injury. An irreparable radial nerve injury calls for tendon transfer within a few weeks following injury or whenever previous operative incisions are healed. A direct injury to the interosseous nerve, at the point where motor filaments enter the muscle bellies of the extensors, usually allows early tendon transfer. With the dorsal interosseous nerve lesion, the wrist extensors may be adequate but a substitute is necessary for the finger and thumb extensor muscles. Tendon transfers ordinarily should not be done while there is evidence of sensory or motor regeneration of the radial nerve. If there is evidence of motor recovery, observation for 12 to 18 months should be continued before a final decision concerning tendon transfer is made.

FIG. 6, A



There was fracture of the humerus with immediate paralysis of the muscles supplied by the radial nerve. At exploration by the attending surgeon on the day of injury the nerve was found to be intact. Five mos. later with no evidence of motor recovery, a second exploration was done. A fairly extensive neuroma in continuity was found; the attending surgeon decided against resection. Partial recovery of motor power during the next 6 mos. amounted to 20% of normal. Thirteen mos. after injury the nerve was again explored; the firmness of the nerve with partial motor recovery discouraged resection of neuroma. Tendon transfer procedures were then used to supplement partial motor recovery.

FIG. 6, B and C



(B) Partial wrist extension possible prior to tendon transfer. Hyperextension deformity of the metacarpophalangeal joint of the thumb is due to contracture. Finger extension was possible through tension effect but not through active motor power. (C) The flexor digitorum sublimis of the ring finger has been transferred to the extensor pollicis longus of the thumb. Arthrodesis of the metacarpophalangeal joint of the thumb has been done to correct the hyperextension deformity.[39] The flexor carpi ulnaris has been transferred through the interosseous membrane and inserted into the common finger extensors distal to the wrist joint. One year later (1953) adequate function had resulted.

Discussion

Recovery from nerve injury is not an all-or-none phenomenon. A nerve may regenerate and muscles may regain function in varying degrees. The treatment of each individual pa-

tient will be determined after consideration of the mechanism of injury, presence or absence of a penetrating wound, whether or not the humerus is fractured and the extent of soft tissue injury. Immediate examination of the nerve may be done if there is an open wound or if, for some reason, a closed fracture needs to be opened. If the wound is compound the nerve segments may be left undisturbed or, if they are very close together they may be pulled together by a single wire suture placed in the area of obvious damage. If the nerve is found to be severed at the time a closed fracture is being operated upon, the surgeon must decide between immediate or delayed suture. The decision is not clear-cut but it must be emphasized that delayed suture, 6 weeks later, does result in excellent recovery. The amount of damaged nerve which must be resected is more clearly demarcated after this length of time. In addition, there is epineurial thickening which technically allows an easier suture. If a complete nerve laceration is suspected, there is no evidence which indicates that immediate suture gives a better end result than a delay of 6 to 8 weeks.[5]

If, for some reason, immediate exploration is done, and if the wound can be closed, an intact nerve should be protected from the humerus by interposition of muscle tissue between the nerve and the fracture site. Gelfoam may be used to protect the nerve from the bone. If the nerve is found in the fracture site at the time of exploration, it will be necessary to observe the patient for several weeks before the decision can be made as to whether or not resection of the damaged segment should be done.

In most instances a delay of 6 to 8 weeks before exploration of a closed nerve injury or before definitive repair of a known laceration is not detrimental. A nerve severed by fracture may be repaired at this time under optimum conditions. Humeral shortening, if necessary, will not delay appreciably the rate of union. Any indications of delayed or nonunion may receive appropriate treatment at this time by bone grafting and internal fixation. A nerve in continuity may receive appropriate treatment, either in the form of resection, neurolysis or observation only.

Injuries not associated with fracture may be clearly assessed following the waiting period of 6 to 8 weeks if there is no evidence of sensory or motor regeneration. Tendon transfer procedures should be explained to the patient prior to nerve exploration so that proper timing of the tendon transplants may be arranged. Occasionally, a part or all of the transfer procedure may be done at the same operation if an irreparable nerve lesion is found. This is particularly true following injuries to the dorsal interosseous nerve, which frequently accompany extensive damage to the muscle belly of the wrist and finger extensors. If exploration is done and an irreparable nerve lesion is found, tendon transfer procedures can be conveniently arranged after adequate healing of the wound has occurred so that a tourniquet may be applied for the procedure. This usually requires about 6 weeks. This coordinated planning will usually result in the patient's acceptance of tendon procedures and will prevent the patient from accepting a poor functional result and declining tendon surgery.

Once a satisfactory nerve suture has been accomplished, the surgeon must wait 6 to 8 months before considering tendon substitutions, unless, of course, there is continued evidence of muscle regeneration. If partial recovery does occur and is progressing, the surgeon should wait 18 to 24 months before accepting the final end result. Even at this date a tendon transfer may supplement partial recovery which has occurred.

Neurolysis should be done if the necessity for delayed exploration is indicated. Nevertheless, if this procedure is carried out within 5 to 6 months following the injury, there is no proof that freeing the nerve from surrounding fibrosis necessarily accelerates the extent or rapidity of muscle recovery. This impression is borne out by the fact that progressive muscle recovery without neurolysis began as late as 6 months following injury and progressed to full recovery. Again, the extent of recovery depends on the location and severity of the initial injury.

Conclusion

Radial nerve injury associated with or without fracture demands careful and considerate deliberation as to when exploration of the nerve should be done. Immediate surgical examination of the nerve may be beneficial if the nerve is thought to be impaled on a major

fracture fragment or if it is suspected of being in the fracture site with inability to reduce the fracture. Delayed operation (6 to 20 weeks), however, for nerve suture or resection of a neuroma, is compatible with satisfactory recovery of muscle function if the nerve is reparable.

An adequate nerve suture within 5 months (preferably within 3 months) following the original injury may be expected to give a result superior in both coordination and strength to that obtained by tendon transfer.

The physician, when confronted with a radial nerve injury, should have an over-all plan as to the proper time for nerve exploration, methods of fracture fixation, the necessity for neuroma resection, the possibility of humeral shortening and the correct timing for tendon transfer procedures. Throughout this entire program, contractures should be prevented, joint motion maintained and muscle re-education accomplished.

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LM-1—J—7-58

Superficial X-ray Therapy*

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THIS PROJECT is a brief review of a few of the important fundamentals of superficial x-ray therapy. There is no intent to instruct in, or outline correct technics. We know that every radiologist has developed his own procedures for the management of a patient, and technics that apply to his equipment and his desired result. But it is interesting to re-examine the physical characteristics of a low voltage beam.

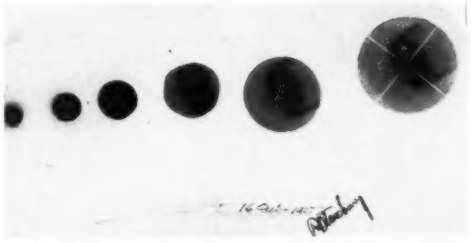
Many x-ray manufacturers furnish cones that may be adapted to any one of several small sized fields. The cone fixed in place acts as a pointer and gauge of distance. But there is no assurance that the central beam passes through the center of the cylinder until some type of a test is made by the owner-operator. When the equipment is installed the tube is placed in its cradle and aligned with a jig and by eye sighting. To test the alignment a pinhole accurately placed in the center of a thin lead disc fitted over the end of the cone base plate, will produce a pinhole photograph (Fig. 1) of the focal spot and its position in the field at the distal end of the cone. Regulated current and time exposures will often produce the outline of the anode and the geometry reflected from its surface. A central image of the focal spot insures equalized distribution of the beam on the surface of absorbing media.

On the surface of a phantom, readings indicate that the central beam may or may not be on center but the surrounding distribution of energy is fairly homogenous and patterned in circles predicted on the isodose curves. Whereas isodose readings in a cross section of the beam in air tend to follow the geometry of the photons reflected from the surface of the anode and the shape of the focal spot (Fig. 2).

Changes in the shape and position of the focal spot have been observed in the pinhole photographs with a change in current. Fluctuations in line voltage and erratic electrostatic flow around the envelope will affect the electron stream from cathode to anode and its focusing to such an extent that images of the focal spot have been seen to dance above and below a base line on a fluoroscopic screen. Isodose tracings of large cross sections of the beam in air have shown peculiar shapes conforming with defects observed in the focal spot pinhole photographs.

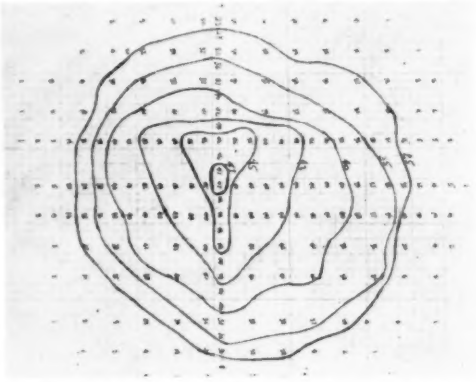
Free air readings may quickly be recorded by moving an ionization chamber ratemeter through the cross section of a beam taking readings at regular points in a checkerboard

FIG. 1



Pinhole autograph of the focal spot at the end of the tube projected through a thin lead disc with a central pinhole.

FIG. 2, A

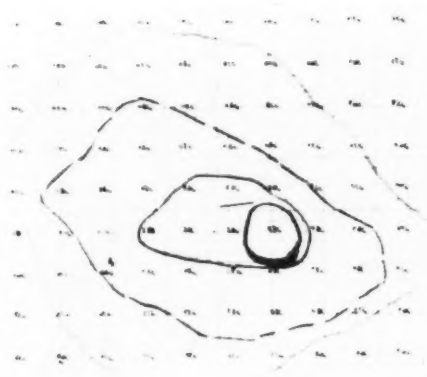


Isodose tracings in air obtained by moving the ionization chamber through a cross section at right angles.

*Chairman's Address, read before the Section on Radiology, Southern Medical Association, Fifty-First Annual Meeting, Miami Beach, Fla., November 11-14, 1957.

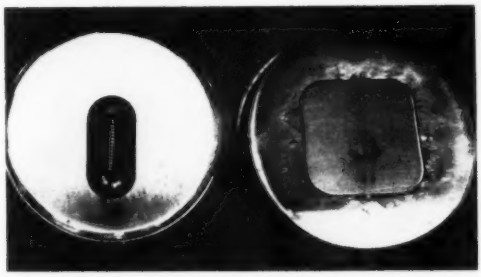
†From the Department of Radiotherapy, St. Joseph Infirmary, and the Department of Physics, University of Louisville, Louisville, Ky.

FIG. 2, B



Isodose tracings on the surface of a phantom at right angles to the beam. The central beam is off center.

FIG. 3



Note the nipple shaped etching on the surface of the anode. It is believed that the "defect" in the electron stream falling on the anode is reflected in the pinhole photograph in figure 4 and also in the air tracing shown in figure 2, A.

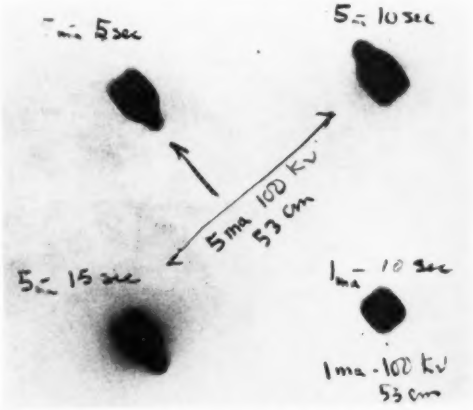
pattern. Readings of the same order are connected by lines to show the iso-distribution. The probe may be rapidly and accurately moved through its pattern by a slave unit controlled by a master set of matched selsyn motors to a central table precisely in any direction. A point position on the master table plotting board is duplicated in position by the probe attached to the slave unit. Thus a continuous procedure is developed which replaces the tedious, endless task of individual readings using a condenser r-meter.

The peculiar distribution shown in the isocurve (Fig. 4) was explained when the tube became defective and had to be replaced. The glass envelope was broken away to expose the anode. A nipple shaped etching in the focal spot area marked the pattern of the electron stream (Fig. 3). It had approximately the same shape of the peculiar central distribution of the isodose air tracing and the pinhole photograph made by using a current of 5 ma (Fig. 4). This is the same current used on the tube during therapy.

The absorption of the low energy beam in layers of aluminum is the classical way of defining the quality of the beam.[1] The absorption curve indicates that some radiation will be transmitted regardless of the thickness of the aluminum. Thus the half value layer is used as a definition. In the absorption curve shown it was found that the addition of 1.52, 1.47 and 1.40 mm. of aluminum would reduce the primary unfiltered intensity of 1/2, 1/3 and 1/4 of its original value. This relation of successive layers of approximately the same thickness may be seen by inspecting figure 5. The wide differences between the 1.52 HVL and the 2.48 HVL indicate a wide spread in the wave length energies. The absorption curve tends to become linear as the beam approaches a higher quality and successive HVL's approach a single value (Fig. 6).

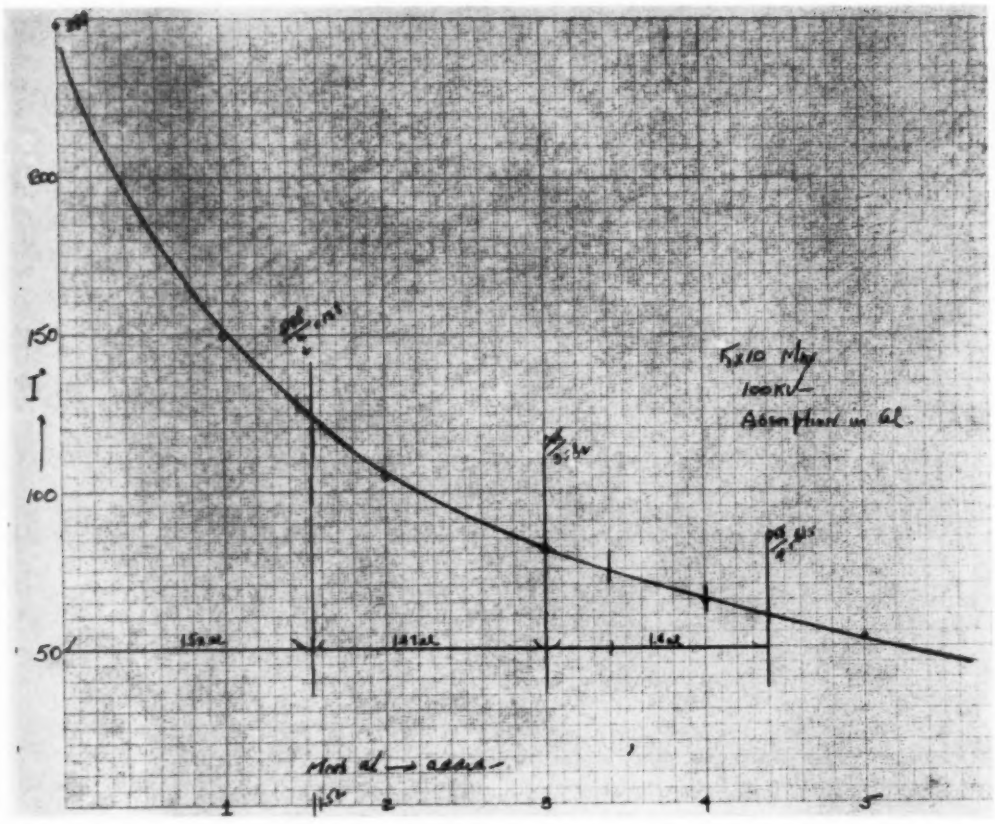
Areas to be treated with superficial x-ray therapy may be outlined directly on the skin with lead foil, or similar areas may be formed by projecting the beam through apertures inserted in the base plate. Surface dose readings indicate that the projected field receives less than the area outlined with sheet lead because the foil reduces a larger open port to the desired size and thus receives backscatter from both the lead foil and the transmitted dose. The accompanying curves show an 8 to

FIG. 4



Pinhole photographs of the anode at 5 ma and 1 ma. Note the difference in shape with change in current.

FIG. 5

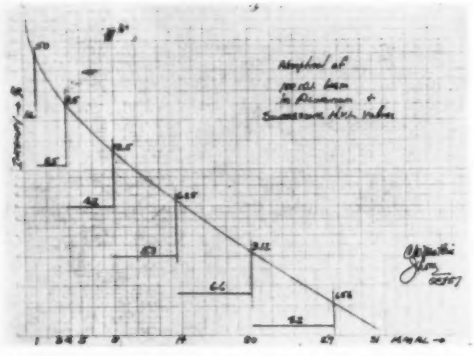


An illustration of the reduction in the primary intensity by 1/2, 1/3, and 1/4 of its original value by the addition of approximately equal layers of aluminum.

10% increase when lead foil is used to shape the port (Fig. 7).

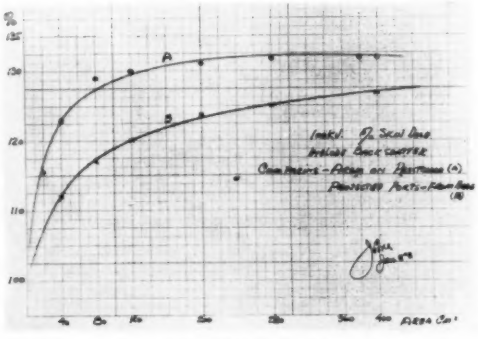
The increment from backscatter may be illustrated by covering an ionization chamber

FIG. 6



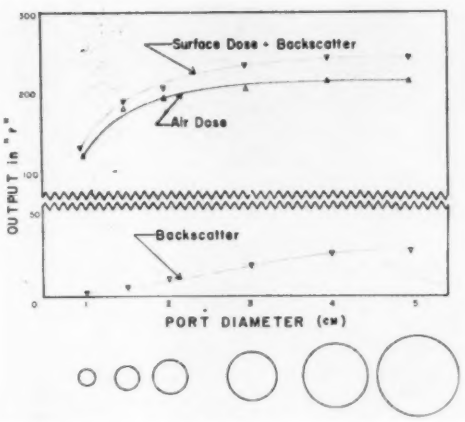
Absorption of a 100 K.V. beam in aluminum and successive HVL values.

FIG. 7



Curves to compare the total surface dose. Curve "A"—Fields shaped with lead foil. Curve "B"—Similar areas projected through apertures in the base plate.

FIG. 8



The two curves in the upper portion compare air dose and surface dose obtained from commercial cones of indicated size. The curve in the lower portion was obtained by covering the chamber with a lead shield so that only backscatter readings were recorded.

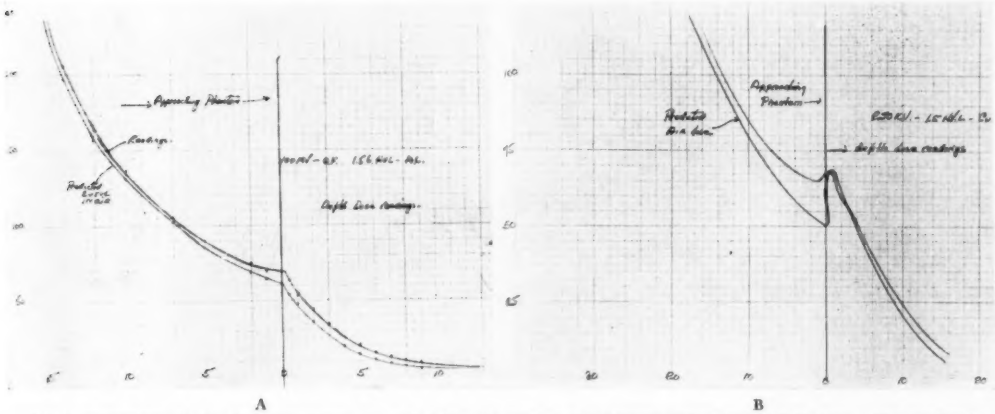
with a sheet of lead sufficiently thick to absorb 99% of the energy received by direct radiation. The lead covering is carefully shaped to shade the thimble and the stem of the chamber. The instrument is then half buried in the phantom. The resulting readings in various sized areas fall on a curve reflecting the increasing backscatter with an increase in field size (Fig. 8).

The family of curves comparing air dose, surface dose, and backscatter is interesting and useful since the related areas are fixed by the set of commercial cones.[2,3] A full set of isodose depth curves for these and similar columniating cylindrical cones have been published, and is available for use. Small field dose calculations should be based on the number of centimeters of exposed area, plus backscatter, and should not be given as a statement of air dose.

The characteristic change occurring within an x-ray beam as it falls on the surface of an absorber may be shown by moving an ionization chamber distally through the central axis to a surface and carried on below to specified depths. The air dose readings will decrease as predicted with an increase in distance until the chamber closely approaches the surface, and then the air dose is significantly increased until the surface dose is obtained. A comparison of the predicted dose in air to the position of the surface and the center line depth dose with a recording of the chamber at various positions in juxtaposition to the surface, is very illustrative (Fig. 9, A and B).[4]

The absorption of a beam in some media such as prestwood[3,5,6] offers a practical survey of its energy in therapy cases. The half value layer in the media is an excellent standard of quality in superficial therapy.[7] Several readings were obtained from various thicknesses of patients appendages and skin folds of adipose tissue, and plotted to compare with the centerline depth dose readings in prestwood. The tissue readings formed a curve that

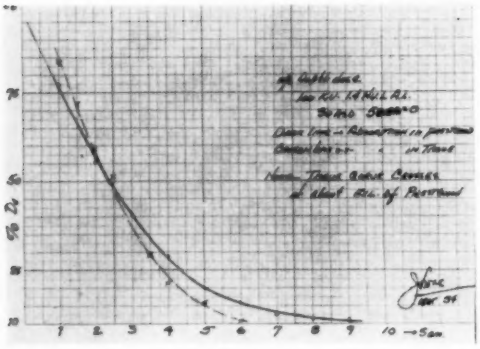
FIG. 9



A B

(A) A comparison of the dose rate above, at, and below the surface of a phantom using the 100 K.V. beam. The predicted air dose rate is changed very little by backscatter from the phantom. (B) The 250 K.V. beam in air receives a considerable backscatter from the phantom. The change is noted at 10 cm. above the surface and increases rapidly with a decrease in distance.

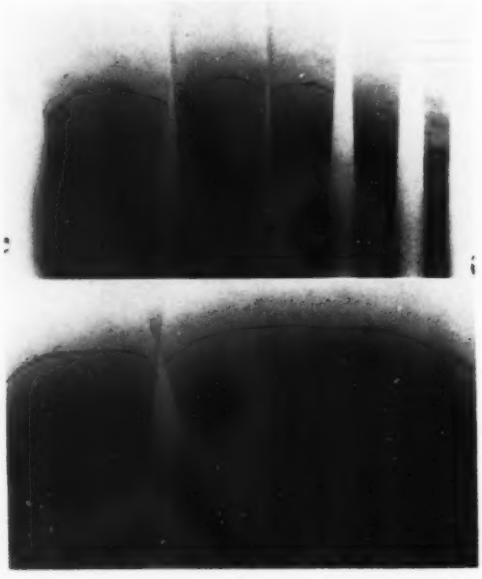
FIG. 10



The curves illustrate readings obtained in a phantom and in tissue. They cross at about the HVL of the phantom because the phantom is homogenous in density said to represent the "average" specific gravity of the body.

crossed the phantom depth dose readings near the half value layer (Fig. 10).

FIG. 11



Autographs of various sized beams through commercial cones, all of the same surface dose. The iso-density lines obtained by densitometer readings illustrate the increase in depth dose with increase in field size. These lines conform in shape to the isodose curves usually obtained.

The difference in depth dose[9] obtained from several different sized cones may be illustrated by exposing the edge of a film to the axis of the beam from each of the cones. All exposures should be of the same time interval and the same intensity, and the film should be vertical in the axis for each exposure. Densitometer readings for three different gamma density illustrates the marked increase in density or depth dose as the field size increases (Fig. 11).

The volume dose for larger areas is magnified greatly over smaller field volume doses even though the air dose reading at the skin position remains the same. Such use of the air dose is confusing.[8] Examples of a 2 cm. diameter cone and a 10 x 15 cm.[2] open field differ only by 30% in surface dose of a factor of 1.3, yet the volume dose to the half value layer differ by a factor of 50.

Treatment courses of 100 r (air dose) weekly for 5 weeks to each side of the face, repeated in several months, bring up the accumulated dose of several hundred thousand roentgens absorbed. The evidence is in the characteristic skin atrophy and telangiectasis that slowly develop in 8 to 10 years.[7]

Acknowledgment

Pinhole focal spot studies by Robert Stansbury, M.D. Cooperative assistance of the Resident Staff. All graphs and curves produced in the department. Secretarial assistance by Miss Wanda Meyer.

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Electroencephalographic and Clinical Correlations in Epilepsy Beginning in Adulthood*

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Epilepsy becoming manifest in adult life has often been considered as probably due to either a tumor or post-trauma to the head. The authors agree with current thinking that this is not the case. They urge that though the EEG may be a most helpful tool, it must be used in conjunction with a detailed history.

THE CLASSIFICATIONS OF EPILEPSY beginning in adult life, especially those based upon electroencephalographic data, have been defective because no adequate attempt has been made to separate the various types of clinical epilepsy.[1-3]

This study is directed toward various clinical correlations of the epilepsies beginning after the age of 20 and before the age of 50. The study involves 110 cases in which there was definite clinical evidence of epilepsy and also electroencephalographic evidence of seizure discharges. Specific criteria for the selection of case material were set up as follow: (1) The age of onset of seizures had to be after the patient's 20th birthday and before the 50th birthday. No case was included that might have had questionable seizures earlier in life, such as a history of blackout spells or febrile convulsions in infancy or childhood. (2) No cases were included that had in the abnormal EEG records more than minimal evidence of focal or generalized slow wave activity. (3) All EEG records had to show the classic epileptiform abnormalities as classified by Jasper,[4] with the exception of paroxysmal rhythmic waves. Gibbs' 14 and/or 6 per second positive spikes and 6 per second spikes and waves were also included.[5] These abnormalities are enumerated by Jasper: (a) sporadic fast and slow spikes, (b) sharp waves, (c) sharp and slow wave complexes, (d) wave and spike, and (e) multiple spike bursts. All bilaterally synchronous and paroxysmal discharges were considered subcortical or "centrencephalic" in origin.

Previous studies have, in part, neglected any attempted correlation between the age of onset of "adult" epilepsy, as defined above, and the location of the EEG abnormality.[1]

We have purposely excluded from this study the seizures that occur with excessive alcoholic intake or during the withdrawal of alcohol in prolonged intoxication. Our reason for this exclusion is that in many of the cases of so-called "rum fits" no typically epileptic discharge is noted in the EEG, but frequently the only change is low voltage fast activity or nonspecific abnormalities grading to no EEG abnormality.

In the analysis of our cases we intended also to test the neurosurgical dictum that any seizures occurring for the first time in adult life should be a signal for exclusion of brain tumor.[6]

It should be noted that adult convulsive seizures will vary in etiology depending upon where the case material is observed. One investigator may see a high percentage of "rum fits" while the same investigator finds a low percentage of brain tumors in his material.[3]

Clinical Studies

Our case material has been carefully studied for the possibility of brain tumor by neurologic and neurosurgical means, and by electroencephalography. We were interested in the frequency of occurrence of neoplasm in EEG records showing only epileptiform discharges

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with minimal slowing seen in the record. The outstanding abnormality had to be epileptiform discharges.[4]

The following clinical data were obtained on the patient:

(1) The habitual seizure pattern. When more than one type of epilepsy existed the most frequent variety of seizures was chosen to represent the cases. The following types of seizures were recognized: (a) minor seizure, or petit mal,—characterized by a brief period of unconsciousness without motor or sensory localizing signs; (b) generalized seizures,—the classic tonic, clonic seizure without aura; (c) myoclonic,—minor seizures with generalized myoclonic jerks; (d) focal motor,—seizures of the classical Jacksonian type; (e) focal sensory,—seizures with unequivocal sensory aura with or without motor components; (f) psychomotor seizures,—those seizures with evidence of automatism, or other temporal lobe phenomena (déjà vu, hallucinations, etc.); (g) autonomic seizures in which vascular instability, pilomotor and other autonomic phenomena were the major presenting symptomatology.

(2) The frequency of seizures was determined by using the maximum frequency of seizures at any time during the course of the illness.

(3) The presumed etiology: (a) A traumatic epilepsy was diagnosed only if the following criteria were fulfilled: (1) a clear history of commotio-cerebri with unconsciousness lasting longer than one-half hour; (2) or the presence of clear-cut neurological signs following the head injury; (3) and the seizures must have begun within a 5 year period after the injury (25 cases). (b) Idiopathic epilepsy was diagnosed in those patients whose neurologic study was negative and there was no history of other etiologic factors (67 cases). (c) Neoplasm was diagnosed when lesions were confirmed by operation, or by unequivocal roentgenographic evidence of neoplastic growth within the cranial cavity (8 cases). (d) Vascular disease was diagnosed in a small group of cases on the basis of arteriographic abnormality or clear-cut history of vascular accidents (3 cases). (e) Inflammatory lesions (again a very small group) were diagnosed on the basis of the clinical history as well as serologic or pathologic evidence of an inflammatory process (3 cases). (f) The others consisted of 2 cases of multiple sclerosis and two cases of toxic drugs.

Results

EEG Classification. This data is summarized in table 1. In classifying the EEG records, 85.5% (94 patients) were considered to have focal lesions. Sixteen patients or 14.5% were demonstrated to have subcortical or "centrencephalic" type of discharges. (By the "centrencephalic" type we mean bilaterally synchronous, paroxysmal, and presumably subcortical discharges.) The focal lesions were subclassified as to the area in which the abnormality occurred. This data is summarized

TABLE 1

EEG CLASSIFICATION

Types	*20-30*		*30-40*		*40-50*		*Total*	
	Number	*Percentage*	*Number*	*Percentage*	*Number*	*Percentage*	*Number*	*Percentage*
Centrencephalic	11	19.0	4	9.8	1	9.1	16	14.5
Focal	47	81.0	37	90.2	10	90.9	94	85.5
Total	58	100.0	41	100.0	11	100.0	110	100.0
Group %	52.7		37.3		10			

TABLE 2

LOCALIZATION OF TEMPORAL LOBES

Localization of EEG Epileptiform Discharge	*Percentage in Age Range*				*Totals*	
	20-30 Percentage	*30-40 Percentage*	*40-50 Percentage*	*Number*	*Percentage of Focal*	*Percentage of Total Patients*
Left temporal	53.2	51.0	50	48	51.1	43.6
Right temporal	23.4	16.2	10	19	20.2	17.3
Bitemporal	12.8	8.1	20	11	11.8	10.0
Total of temporal	89.4	75.5	80	78	83.1	70.9

TABLE 3

LOCALIZATION OTHER THAN TEMPORAL LOBES

Localization of EEG Epileptiform Discharge	*Percentage in Age Range* 20-30 Percentage	30-40 Percentage	40-50 Percentage	*Totals* Number	Percentage of Focal	*Percentage of Total P & S*
Left parietal	0	2.7	0	1	1.0	.9
Right parietal	2.1	2.7	0	2	2.1	1.8
Left frontal	0	5.4	10	3	3.2	2.7
Right frontal	2.1	0	0	1	1.0	.9
Parasagittal	6.4	5.4	0	5	5.3	4.5
Left central	0	2.7	10	2	2.1	1.8
Multiple	0	5.4	0	2	2.1	1.8

in tables 2 and 3. Fifty-one and one-tenth per cent were left temporal, 20.2% of the lesions were found to be right temporal, and 11.8% were bitemporal. The remaining 16.9% were divided about equally between parietal, frontal, parasagittal, and central areas, while two patients showed multiple foci. As can be seen in table 1, there was a drop in the occurrence of "centrencephalic" epilepsy after the age of 30. The localization of the focal lesions percentagewise, as summarized in tables 2 and 3, remained fairly constant throughout the three decades surveyed.

Presumed Etiology. This data is summarized in table 4. Sixty-one per cent of our cases were diagnosed as idiopathic (etiology unknown); 22.7% were considered to be due to trauma, and only 7.3% were demonstrated to be neoplastic; the remaining 9% were of varied etiology but in very small numbers (see above). The vascular and inflammatory lesions constituted so small a per cent that the figures are without significance.

Frequency of Seizures. As is summarized in table 6, the frequency of seizures progressively declined in the three age groups. The younger patients tended to have a much higher incidence of seizures. Thirty-eight per cent of the 20 to 30 year group had seizures more frequently than one time per week. None of the patients in the 40 or 50 year age group had seizures as frequently as one time a week.

Habitual Seizure Pattern. (Table 5) A very high incidence (70%) of EEG abnormalities were localized in the temporal lobes;

TABLE 4

PRESUMED ETIOLOGY

Etiology	*Percentage in Age Range* 20-30 Percentage	30-40 Percentage	40-50 Percentage	*Total of All Ages* Number	Percentage
Idiopathic	63.9	56.1	63.6	67	61.0
Trauma	22.5	22.0	27.3	25	22.7
Neoplastic	3.4	12.2	9.1	8	7.3
Vascular	3.4	2.4	0	3	2.7
Inflammatory	3.4	2.4	0	3	2.7
Other	3.4	4.9	0	4	3.6
Total	100.0	100.0	100.0	110	100.0

TABLE 5

HABITUAL SEIZURE PATTERNS

Type Seizure	*Age Range* 20-30 Percentage	30-40 Percentage	40-50 Percentage	*Total* Number	Percentage
Minor	8.6	7.3	18.2	10	9.1
Generalized	27.6	46.4	45.5	40	36.4
Myoclonic	5.2	0	0	3	2.8
Focal motor	8.6	17.1	9.1	13	11.7
Focal sensory	1.7	2.4	0	2	1.8
Psychomotor	46.6	22.0	18.2	38	34.5
Autonomic	0	2.4	0	1	0.9
Unknown	1.7	2.4	9.1	3	2.7

TABLE 6

FREQUENCY OF SEIZURES

Frequency	Percentage in Age Range 20-30 Percentage	30-40 Percentage	40-50 Percentage	Total Ages 20-50 Number	Percentage
1- 6 per year	31.0	46.4	63.6	44	40.0
7-12 per year	19.0	7.3		14	12.7
13-50 per year	12.0	22.0	27.3	19	17.3
50+ per year	38.0	24.3		32	29.1
Unknown	0		9.1	1	0.9

however, 34.5% of the whole group described their habitual seizure pattern as psychomotor. Another 36.4% of the total number of the patients described their seizures as generalized. The description of focal motor and sensory seizures in the clinical records did not correlate well with the EEG localization of lesions either in the frontal, central or parietal regions as might have been expected. The incidence of myoclonic and "petit mal" seizures, however, did correlate well with the per cent of "centrencephalic" records—presumably compatible with "petit mal" seizures.

Discussion

In reporting a study of any group of patients we must be aware that certain factors of selection of the cases must be considered. This particular group of patients is made up of adult male veterans now residing in North Carolina or adjoining states.

In dealing with the problem of epilepsy in the veteran, and its incidence of occurrence in various age groups, it must be realized that relatively few of a 40 to 50 year age group could be studied. This is due to the simple fact that the group between 40 and 50 years in 1955-1957 were not veterans of either World War I or II because of the selected ages for induction. It must also be noted that some adult epileptics who might have been in our study were not inducted into the service because they were screened out because of their epilepsy and are therefore not eligible for VA admission. Attempts at correlating the percentage of patients in the various age groups with the percentage of adult American males in the same age groups[7] reveals no correlation. Furthermore, no correlation exists between the ages of onset and the age at time of admission for the general hospital population. The age of admission of the patients studied here, however, does correlate with the general hospital population (Table 7).

In previous studies of epilepsy in unselected groups of patients, approximately 50% have been shown to have focal epileptic lesions. However, Kershman,[1] in studying a group of 262 veterans demonstrated focal lesions in 66.5% of his patients. His patients were selected on the basis of a clinical diagnosis of epilepsy. When one corrects his data by excluding the patients with normal EEG records, the incidence of focal epilepsy rises to 71.9 per cent. If one further corrects this data for the patients with diffuse abnormalities the per cent rises to 77.7 per cent. This correlates reasonably well with the 85.5% which we obtained. Our data further correlates well with that of Kershman in the incidence of "subcortical" or "centrencephalic" epileptic records. In both series there was a decreasing incidence of this type record with age.

Many studies have been directed toward the frequency of epilepsy following cerebral trauma as well as the incidence of epilepsy in patients with brain tumor.[4,8,9] However, with the exception of Giroires'[3] study of epilepsy in adulthood, few investigations have attempted to determine the etiology of the seizures.

TABLE 7

Age Groups	Percentage U. S. Population 20-50	20+	Age Hospital Population 20-50	20+	Age of Examination	Age of Onset of Epilepsy
20-30	33.5	21.8	23.7	15.6	26.3	52.7
30-40	35.2	22.8	50.6	33.3	44.6	37.3
40-50	31.3	20.4	25.7	16.9	22.7	10.0
Over 50		35.0		34.2	6.4	

In our series one might have, *a priori*, expected a rather high incidence of post-traumatic seizures.[8] Twenty-two and seven-tenths per cent of our patients had sufficient evidence of trauma to seriously consider this as an etiologic factor. It was surprising that few of the patients with good histories of trauma had incurred open head injuries.

The incidence of brain tumor in this series, 8 out of 110 cases (7.3%) is sufficiently high to stress the importance of the association of seizures and brain tumor. These patients had records which were more compatible with the record of an "idiopathic epilepsy" than with tumor. This is a dramatic demonstration that there are serious limitations of electroencephalography for diagnostic purposes. It also stresses the importance of adequate neurologic and neurosurgical examination, in addition to EEG.

Recently there has been some change in the popular concept that epilepsy beginning in adulthood means brain tumor until proven otherwise. This is manifest by the change in the two works by Penfield and his co-authors.[4,6] In his book with Erickson, in 1941, tumor was listed as the primary etiologic agent of seizures in age group from 35 to 55, whereas in 1954 in his book with Jasper, tumor became only one of three causes of seizures in adults (35-55). The results of our study are in keeping with Penfield's 1954 report, but this should not minimize the importance of eliminating tumor suspects.

The decline in frequency of seizures with advancing age correlates very well with the decreasing incidence of seizures in the various age groups. This is especially true of the patients with more than 50 seizures per year. This would indicate for some reason unknown to us that a better prognosis as to frequency of seizures may be given to the older patient who develops epilepsy. Obviously, this does not apply to neoplasms.

Rather distressingly, our poorest correlations were between the clinically described habitual seizure pattern and the EEG classification of the epilepsy. All too frequently, the seizure pattern was called in the chart, grand mal, petit mal, or generalized with no adequate description of the seizure. These poor correlations of diagnostic description of seizures may be ascribed to the inability of the patient to describe, or to a lack of knowledge of, his seizure pattern. It could also be due in part to the inability of the physician to elicit an adequate history due to his own inexperience or lack of knowledge in the field of epilepsy. We are quite in agreement with Kershman,[1] and Penfield and Kristiansen[10] who have emphasized the particular necessity of eliciting detailed information from the patient, his relatives, friends, and any other available witnesses about the aura and onset of the attacks.

We would like to emphasize that the information obtained from the EEG should always be correlated with the clinical data obtained. Unless the electroencephalographer and the clinician pool their data there will be less than optimal diagnosis and treatment of the patient.

Acknowledgment

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Discussion (Abstract)

Dr. R. M. Paddison, New Orleans, La. Late life seizures, as any seizures, are a problem in differential diagnosis. As John Hughlings Jackson stated in 1870. "A convulsion is but a symptom and implies only that there is occasionally an excessive, and a disorderly discharge of nerve tissue or muscles."

The authors have included patients in the 20 to 50 age group. They have been correct in excluding cases with onset in early life, but I do not feel they are justified in excluding cases of focal slow wave

activity or of generalized slow wave activity. The divergence of my point of view is that patients with various forms of cerebral or metabolic disease may have seizures so we must have a clinical approach to the problem rather than solely a classification on the basis of electrographic abnormality.

Focal electrographic abnormalities predominate in Dr. Wilson's material, and especially deserving of comment is the high percentage of abnormalities in the temporal lobes. This data correlates with the predilection of temporal areas to traumatic injury by the tentorium or bony structure of the middle fossa, or of the hippocampal area to anoxic insult, either vascular insufficiency or from other asphyxial sources. I cannot explain why the left temporal lobe should be more frequently involved. The parasagittal abnormalities occurring so frequently is difficult to explain, but it is my own personal conviction that the parasagittal rhythms are much less prone to derangement than those of the temporal regions.

Idiopathic is to me a term which should be reserved for the paroxysmal or bursting discharges felt to be subcortical and probably of diencephalic or centrencephalic origin. Because we do not always find a cause does not mean we should utilize a form of Greek which means "not a result of other disease, but of spontaneous origin." A focal abnormality is to me never of spontaneous origin, and because our knowledge is not always sufficient to explain the phenomena we observe does not make it appropriate to use the term idiopathic.

To be accurate in furnishing reliable evaluation of the electrographic abnormalities we must include an entire population study, which to me necessitates the inclusion of all the persons with seizures who received electroencephalographic evaluation. Therefore it is imperative that we include the persons with documented seizures who have normal EEG records.

In our laboratories we have been impressed with the extreme caution which must be used in making a diagnosis of a particular seizure type from the electrographic abnormality. Even when extremely good clinical work-ups are available with very adequate historical and observation documentation of particular seizure pattern types, the EEG will not give a direct correlative pattern alteration.

The incidence of tumors in these seizures was 7.6% and we are learning that the old dictum of "Seizure means neoplasm after age 20 years" is an exception in practice at this time.

Livingston, in 1956, evaluated 689 patients with major motor attacks occurring after 20 years of age. Only 2 brain tumors and 2 brain abscesses occurred in his material, and 83 patients had vascular disturbances. Five hundred and twenty-seven or 78% of his patients had what he called idiopathic epilepsy. The EEG's in this group were abnormal in 335 or 67% and normal in the remaining 166 patients.

Berlin evaluated 125 adult male patients with seizures occurring after 35 years of age. Sixty-seven per cent of his patients had no chronic systemic or neurologic disease elicited as a cause of the seizures. Hypertension, closed head injuries, and alcoholism contributed to development of seizures in 32.5% of these patients.

I feel that Drs. Smith and Wilson are to be congratulated on their approach to this problem and I hope they will extend their series, for by such investigations we improve our knowledge of the limitations and reliability of EEG as an ancillary investigative method. I should also like to emphasize that I am in complete accord with the emphasis of the authors on the correlation of electrographic abnormality with careful clinical evaluation of the patient. In the final analysis the clinical studies still must be the determining factor in the treatment of the patient.

The Office Management of Frequently Encountered Ophthalmological Disorders*

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Prevention of the serious complications, which may follow injuries and diseases of the eye as encountered in industry, should always be foremost in the mind of the industrial surgeon.

OF ALL THE COMMONLY OCCURRING INJURIES seen in industrial practice, those to the eye carry the greatest potentialities for serious disability. In the United States there are 300,000 ocular accidents per year, necessitating cessation of work for one or more days. This is one accident every thirty seconds. Insurance statistics show that only 3.3% of industrial accidents resulting in compensation are eye injuries. This proportion is relatively small, but its quantitative aspects are balanced by the relative gravity of these injuries. The average period of disability for ocular industrial injuries is 15 weeks, in comparison with an average of 5 weeks for all accidents to other parts of the body. More eyes are lost therefrom, than legs, arms, hands, and feet combined.

In addition to compensable eye injuries, there are many hidden losses for both employees and employers. Compensation is given on a limited basis. It is not computed on the total estimated loss of earnings, nor is it given for the total period of disability. Physicians fees, court costs, noncompensable cases,—these are but a few of the hidden losses sustained. It has been estimated that these add up to four times the amount paid in compensation. On this basis, the annual cost of eye accidents in the United States is $225,000,000 (Kuhn, 1950).

Preventive Measures

It must be emphasized, therefore, that all but the most trivial of eye injuries should be promptly referred to an ophthalmologist, if the welfare of the employee, the employer, and the reputation of the industrial physician are to receive maximum protection.

Proper early treatment can greatly minimize the seriousness of eye conditions. A written procedure should be set up by all industrial plants, whether large or small, giving specific instructions to the workers, and to a nurse, if available, of the course of action to be followed in case of an accident or any abnormality involving the eye. Any workman whose eye is injured, no matter how slight the injury may seem to be, should report at once to the plant physician or nurse. A worker should never attempt to help a fellow worker by looking for a foreign body. The only exception would be in the case of receiving some noxious substance in the eye, causing a chemical burn. All employees should be instructed in such an event to immediately pour large amounts of water—copious flushing—into the injured eye before seeking aid. In this instance, time is of the essence. Generally speaking, however, self-treatment, treatment by fellow workers, or delay in seeking professional aid adds greatly to the seriousness of most conditions.

The greatest problem in the first-aid treatment of eye injuries is that of preventing infection. Each year thousands of cases of infected eyes occur because of delay in getting proper attention; many of these result in permanent partial loss of vision, or even in total blindness. Many types of eye injuries cause little pain or discomfort at the time of the accident. A small speck of dust under the upper eyelid can feel tremendously large and cause acute pain. On the other hand, a large splinter of steel can perforate the globe and remain practically unnoticed. The wound of

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entry heals very rapidly and not until several days or weeks later, when vision starts to fail, does the worker seek help. By this time severe damage has been done, and we are dealing with a siderosis (pigmentation due to the deposition of iron), or an iritis, as well as with the original foreign body.

The plant nurse works under medical supervision. She must be competent to decide a course of action on the basis of the situation, the written procedures, and her skill. The written procedures should include the nature, strength, and uses of all drugs and antiseptics to be used. Cleanliness is all important. The hands should be washed before and after seeing each patient, in order to minimize the possibility of spreading infection. Emphasis should be placed on the importance of avoiding contamination of ophthalmic medication and equipment. During World War II epidemic keratoconjunctivitis was actually spread in dispensaries and medical offices, rather than from worker to worker. The virus can be carried in the conjunctival secretions without producing disease in that person. There is now a law making it mandatory that ophthalmic solutions be sterile,—that is, those made by drug companies. Efforts have been made to package ophthalmic solutions and ointments in a way that reduces likelihood of contamination after they reach the eye tray. Among such devices employed are: sealed plastic dropper bottles with tips that can be cleaned with alcohol after use; unidose containers; disposable plastic droppers; autoclaved disposable fluorescein strips, etc. The use of stock solutions, droppers, and medicine glasses in dispensaries should be eliminated. The preparation most quickly contaminated is fluorescein. Actually, there are few instances where a doctor, nurse, or aid in a plant dispensary need use it. If a foreign body has been removed, or the patient has received an abrasion or laceration of the cornea, it is unnecessary to expose the eye to bacterial infection by using fluorescein. We know that it will stain.

Injuries and Infections

Every eye injury should be carefully described in detail and recorded. The record should contain a complete history of the accident, including date, place and circumstances of accident; when possible, the visual acuity of both the injured and uninjured eye, with and without correction, should be recorded. Very often the eye is painful, and a drop of 0.5% Pontocaine placed in the eyes will facilitate the testing of vision. Pontocaine is, I believe, a better anesthetic than most of the others, as it delays healing less than cocaine, Butyn, or Holocaine. If the eyelids are closed by edema, or hemorrhage into the tissues, separating them gently with a small retractor is sometimes helpful. Of course this must not be done if the injury is of such a nature as to cause one to suspect rupture of the globe, as some of the content of the globe may be extruded. Rupture of the globe can be discovered by palpation with the index fingers to see if there is normal intraocular pressure. If there is rupture, the eye will be mushy soft to palpation.

When an eye is examined, one should think of the following signs and symptoms: pain, photophobia, tearing, muscle balance, and gross field defects. The presence of a wound should be noted, as well as redness, swelling, inflammation, discharge, discrepancy in size or irregularity of pupils, foreign bodies, and bleeding.

Bleeding must be stopped before anything else is done. Since a tourniquet cannot be applied, this must be done either by compression and hot packs or, if large arteries are torn, by picking them up with hemostats and ligating them. A drop of 1:1000 epinephrine solution in the cul-de-sac will constrict the small vessels and lessen bleeding. Contusions and lacerations around the eyes involve areas richly supplied with blood vessels and covered with thin, delicate skin which is easily torn and subject to massive swelling from blood or edema fluid. If the patient has received injuries to other parts of the face or body, the damage to the lids and eyeball may have to wait. Sterile dressings should be applied, and if the eyeball is exposed because the lids are badly torn, tantalum oxide powder should be dusted onto the area, and covered by a soft perforated plastic sheet. An antibiotic ointment may be placed on top of this, followed by a pressure bandage,—again, provided there is no rupture of the globe present. Debridement should not be done. Even small tags of tissue can usually be saved and used in injuries to the eyelids, because of the extremely rich vascular supply to this area. There is no necessity to make immediate repair of such lacerations. Tetanus antitoxin should be

given and parenteral antibiotics administered until the patient can receive specialized management and plastic repair.

Foreign bodies in, or on the cornea are common accidents. About 80% can be safely removed by the plant nurse or industrial physician without the need of specialized management. Removal should be done under 0.5% Pontocaine anesthesia with as little trauma as possible. Careful examination of the lower cul-de-sac with the eye looking upward, of the upper cul-de-sac with the upper eyelid everted, and of the cornea, should be done. A 10 x loupe and a good light source are necessary. One must be sure to scrutinize the lid borders for an occasional fine cilia which may be turned inward.

A nurse should never use a spud or a sharp instrument. Many particles can be removed from the eye (even those embedded in the cornea) by means of a fine stream of saline from an irrigation bottle, or with a tightly wrapped sterile cotton applicator moistened with saline solution. If a rust ring is present, it is best to refer the patient to an ophthalmologist. In the majority of cases, waiting until the sequestrum containing the rust forms and loosens itself is preferable to trying to curette the rust. The pupil should be dilated with 2% homatropine if there is obvious ciliary flush. If there is any sign of failure of the epithelium to heal over, or of beginning infection, the patient should be referred immediately. The slit lamp or the use of ultraviolet light (Hague lamp) in conjunction with fluorescein are very important aids in determining the depth of penetration into the cornea, or the extent of the abrasion or wound. A drop of .02% Furacin, 30% sulfacetamide, or Neosporin ophthalmic solutions should be placed in the lower cul-de-sac, with the eye looking up. In my opinion the eye should be covered with a patch and the patient be instructed to rest both eyes for a period of twenty-four hours, when it should again be examined. A patch, rest, and examination every twenty-four hours should continue until the cornea is completely epithelialized.

It must be remembered that anesthetics, ointments, and the corticosteroids all delay healing. Epithelialization is retarded, even of tiny abrasions, and the eye is exposed to secondary infection,—the one thing we are trying to avoid. Of course, cortisone is definitely contraindicated in a herpetic infection of the cornea, such as dendritic keratitis, as the cornea is apt to perforate with the formation of a hypopion. One should be sure to have an x-ray examination of the orbit taken whenever an intraocular foreign body is suspected, either by appearance or history. Failure to do so constitutes malpractice. All corneal injuries, even the apparently trivial ones, may involve complications which are usually the result of local sources of infection, but which may also occur from some already existing disease, infection, or deficiency in the injured. Pathogens may be present on the lids, conjunctiva, or in the lacrimal apparatus. The age and general health of an individual has a great deal to do with the rapidity of healing of tissues and with the avoidance of complications. Fatigue is another factor. Tuberculosis, syphilis and gonorrhea, hypertension, arteriosclerosis, arthritis and rheumatic conditions, focal infection and herpes are all general conditions which may cause a trivial eye injury to develop serious complications. Quite often this virus of herpes simplex or herpes zoster is activated by trauma and infection results. Corneal injury, even without a demonstrable break in the epithelium, may cause keratitis, iridocyclitis, as well as various degrees of internal and external ophthalmoplegia. These clinical manifestations have also proved to be recurrent. The injury does not cause the disease but does stimulate the virus which has been lying dormant in the tissues to activity. If such a complication occurs within three weeks of an accident, there is most probably a causal relationship. It is interesting to note that once a person is under compensation for an established injury, this compensation continues regardless of the contributory complications due to that individual's general health, or lack of it.

Inflammations

If a person complains of a red eye, we must be able to distinguish between minor and vision destroying processes, especially between conjunctival infection and deep ciliary infection such as occurs in iritis, glaucoma, and corneal inflammation. Dangerous conditions are indicated by a blurred pattern of the iris, irregular pupillary margins, sluggish or absent reaction of the pupils to light, and reduced

vision. Vision is usually not affected in superficial conditions.

Many patients present themselves with a subconjunctival hemorrhage which has very often occurred spontaneously. This may be alarming in appearance, but is usually of no consequence. In ciliary congestion the vessels are straight, radiating from the cornea, and more intense circumcorneally. They cannot be moved over the eyeball by traction on the conjunctiva. If one puts pressure on them by pressing on the eyelid, they will blanch for a second or two. They have a purplish color. Pain and photophobia are present. The pupil is usually small and the iris congested. In conjunctival congestion the vessels are irregular, tortuous, and more marked in the fornices and tarsal conjunctiva. They can be moved over the surface of the eyeball. They are not blanched by pressure because the vessels anastomose freely. The color is brick red. There is usually no pain or photophobia. One can be sure of conjunctival infection if a discharge is present. A drop of 1:1000 epinephrine or 10% Neo-Synephrine will blanch the vessels and the eye will become almost white.

The onset of an acute iritis is gradual. The pupil is contracted or irregular. There are opacities in the media. (Be sure to look with an ophthalmoscope, holding the instrument about a meter away from the patient's eye, and with no lenses in the eye piece ask the patient to look quickly up and down. Then successively rotate increasing plus lenses in order to examine the whole depth of the vitreous.) The constitutional signs are slight. If in addition there are deposits on the posterior surface of the cornea (when examined with a loupe or slit lamp) the condition is acute iridocyclitis.

Glaucoma

If the onset of the attack is sudden, the pupil is dilated or oval, the cornea cloudy and insensitive to pain, the intraocular pressure is increased, and there are severe constitutional signs,—the condition is acute glaucoma.

Glaucoma is the number one cause of blindness in the United States. There are 40,000 new cases discovered yearly, representing about 2% of the population over 40 years of age. In acute glaucoma there is intense pain and the patient will seek help. But in the chronic type of glaucoma there is no pain. The loss of vision is so gradual that it most often goes unnoticed.

Make it a point—BE SURE—resolve now to do routine testing of the intraocular pressure (with a tonometer) of all patients above 40 years of age. Discover your 2% of chronic glaucoma and refer them for specialized management.

Discussion (Abstract)

Dr. L. Benjamin Sheppard, Richmond, Va. We have had the privilege to hear an excellent survey of many of the ocular accidents that may occur with particular reference to those in industry. Dr. Duel has aptly and uniquely brought us up to date on the care each of these accidents may require, not only immediately, but during their subsequent course of treatment.

We all recognize the importance of doing all we can to prevent accidents such as the use of safety glasses in industry.

When an accident occurs prompt care is of great importance as was stressed. If a chemical burn, the immediate profuse washing with water is more important than any thought of neutralization of an acid or an alkali. Ultraviolet, or flash, or thermal burns require cleansing and an antibiotic with immobilization of the eye. Frequently it may be necessary to place a patch over both eyes, until the cornea has healed. It is well to consider irrigation of all burn cases for at least every six hours, following this with a suitable antibiotic such as a solution of sulfacetamide in methylcellulose. Irrigation is necessary because frequently the accompanying conjunctivitis and its secretion is extremely annoying to the patient. It is also wise to advise the patient to keep both eyes closed since it keeps the lids from moving and allows the warmth and nourishment of the conjunctiva to help heal the cornea. This is particularly true if only one eye is involved.

After injuries patients frequently rub the eye infecting it and causing acute conjunctivitis or hordeola. These acute inflammations require cleansing, and the application of an antibiotic solution to which the patient must not be sensitive. Most acute inflammations of the eye will require dark glasses since there is considerable photophobia. Patients who have "pink eye" should be cautioned about rubbing the eyes, and should be informed that it is contagious, not only to folks in their own home but to fellow employees as well. Therefore they should take precautions. It is well to require patients with such acute inflammations to stay away from work, and to come back to you for clearance prior to returning to duty. In this way you not only will keep down the spread of acute inflammations but will have complete control of each individual case.

No two accidents are just alike, so use your common sense in the evaluation of each patient as to whether you need consultation or not. But remember to apply those basic principles of therapy, namely: cleanliness, antisepsis and rest.

Treatment of Acute Gonorrheal Pelvic Inflammatory Disease: The Use of Benzathine Penicillin G in the Ambulatory Patient*

GERDA S. LANDMAN, M.D., LAWRENCE V. PHILLIPS, M.D., and LOUISE FRIEND, M.D.,† *Washington, D. C.*

The control of gonorrhea is still far from complete, because of relapse and re-infection. The method of treatment prescribed offers a better chance of cure and thus reduces infectiousness of these patients. Contact investigation must continue.

In previous years, at the District of Columbia General Hospital, the diagnosis and treatment of acute pelvic inflammatory disease of gonorrheal origin was the responsibility of the Department of Gynecology. With the advent of the promising chemotherapy of Neisserian infections, this condition no longer required the specialized care of the gynecologist. Patients who presented themselves in the emergency room with a clinical picture of acute pelvic inflammatory disease, received varying amounts of sulfonamides and/or antibiotics, and were referred to the gynecology clinic at some future date. In most cases no laboratory data were obtained in the emergency room; spreads and cultures taken in the gynecology clinic rarely detected the causative agent of the infection, since such studies were often conducted after antibiotic therapy. The patients did not realize that they were suffering from a venereal disease. Their contacts, in many instances, went untreated, and soon the patient would reappear in the emergency room with the original complaint.

In July, 1955, it was decided to resort to the use of benzathine penicillin G (Bicillin) and to eliminate repeated clinic visits for administration of short-acting penicillin. Also, to avoid recurrences, the cause of the infection had to be established. To this end, and in agreement with the Department of Gynecology, a program was set up in the following manner:

(1) On every female patient with a presumptive diagnosis of acute pelvic inflammatory disease, spreads from the cervix and urethra are taken by the intern on duty in the emergency room. The slides are air-dried and placed in dated envelopes marked with the name of the patient.

(2) After the physical examination has been completed, the patient receives an intramuscular injection of 1.2 mega units benzathine penicillin. If there is a history of sensitivity to penicillin, another antibiotic is prescribed.

(3) The patient is advised to take hot sitz baths at home, and to refrain from douching for at least one week. She is also given an appointment to the V.D. Clinic in one week.

(4) The spreads prepared in the emergency room are stained with Gram's stain and examined in the V.D. Clinic. Emphasis is placed on the uniformity of the staining procedure, and great care is taken in reading the slides before a diagnosis of gonorrhea is made.

(5) Identifying data and other information on the patients concerned are obtained from the emergency room records.

(6) At the time of her visit to the V.D. Clinic, the patient is informed of her laboratory report. A careful history is taken, and the patient re-examined whenever indicated. Patients whose initial spreads show negative results, are referred to other clinics as required. In case of positive spreads, the patient is given an educational interview, explaining the cause of the disease, its spread and possible complications. She is also told of the advantages of modern therapy with long-acting penicillin. Blood is drawn for a serologic test for syphilis. Information on contacts is obtained, and a referral slip is given to the patient to assure examination and treatment of the contact (or contacts), preferably in our clinic or, if not feasible, by another health department clinic or a private physician.

(7) The patient is instructed to return to the V.D. Clinic 2 weeks from the date of the first Bicillin in-

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Bicillin was furnished by Wyeth Laboratories, Inc., Philadelphia, Pa.

jection. At this time a second intramuscular injection of 1.2 mega units is given, and the patient is advised to return to the clinic if symptoms recur.

Results

During a period of about 18 months (July 19, 1955 through December 31, 1956), 1,604 patients, 1,592 negro and 12 white females, with a preliminary diagnosis of acute pelvic inflammatory disease, were evaluated by the procedure described above. This figure represents over 7% of all female patients, in the age group 15 to 45, examined in the emergency room for various reasons.

Spreads taken on 109 of these patients proved to be unsuitable for examination, and are deducted from the over-all results. Of the remaining 1,495 patients, 621 (41.5%) showed positive results (i.e., gram-negative intracellular diplococci of typical appearance on cervical and/or urethral spreads), and 874 (58.5%) were negative. Had it been possible to employ cultures in addition to spreads, the number of positive results would probably have been considerably increased.

The age distribution of the patients with positive spreads ranged from 14 to 47 years, with the majority of the patients (372, or 59.9%) between 20 and 30 years of age, but twice as many "teenagers" (166, or 26.8%) as women over 30 (83, or 13.3%).

Of the 621 positive patients (616 Negro and 5 white) 353 (56%) returned for interview and further treatment.

The patients with negative spreads showed a similar age distribution (15 to 57 years); however, there was a shift toward the older age group, there were only half as many "teenagers" (14.2%) as women in their thirties and forties (27.9%). The return rate of these patients did not differ greatly from that of the positive group; here, too, more than half (55.5%) returned to the clinic for further evaluation.

The course of 353 gonorrheal infections was followed in the V.D. Clinic, occurring in 317 patients, 36 of whom had more than one infection, during the 18 months of this study. We are dealing here with a group of patients prone to acquire venereal diseases; 64 patients gave a history of treatment for gonorrhea in previous years, 35 were known syphilitics, and 2 had once received treatment for lymphopathia.

Only 5 of the 317 infected patients refused or were unable to furnish any contact information, the remaining 312 named a total of 403 contacts. It was noted that the average female patient has a better knowledge of the whereabouts of her contacts than the male patient. Similar observations have been reported by others.[1]

Of the 403 male contacts 82 (20.4%) were examined and treated at the V.D. Clinic of this hospital, 161 (39.9%) were treated by other health department clinics or at dispensaries of the Armed Forces, 87 (21.6%) received treatment by local physicians. The fate of the remaining 73 (18.1%) is unknown. From these figures it is evident that over 80% of the male contacts named received some form of antibiotic therapy.

Five of the 82 male contacts seen in our clinic had negative spreads for gonorrhea, but were treated for epidemiologic reasons. Of the remaining 77, 42 (54%) had no symptoms of gonorrhea or only very slight discomfort, and stated that they would not have sought medical advice on their own accord. The fact that many male gonorrhea patients are not aware of their infection has been pointed out in recent literature.[2-4]

Eighteen male contacts treated in our clinic named additional female contacts; information on these was given to the health department authorities for follow-up and disposition.

All the patients treated for acute gonorrheal pelvic inflammatory disease and followed in our clinic showed marked improvement, both subjectively and objectively, within one or two weeks after the first injection of penicillin. During the first two months of our study spreads and/or cultures were taken at the time of the first and second return visit; all of these were found to be negative.

The 16 patients with more than one gonorrheal infection had symptom-free intervals of 3 months or more; 14 of them named a different contact at the time of their second episode. We have reason to believe, therefore, that the recurrence represented re-infection rather than relapse.[5]

Reactions

Ten patients with a presumptive diagnosis of pelvic inflammatory disease gave a history of sensitivity to penicillin at the time of their

initial visit. They were treated with a different antibiotic and are not included in this study.

General. Sensitivity to benzathine penicillin (Bicillin) was observed in 8 of the 1,604 patients. We can assume that this figure is reasonably accurate since, in our experience, patients who react to a drug will return to the clinic where it was administered. This rate of 0.5% falls into the lower limits of the 5 to 10% generally reported as the reaction rate to penicillin; this might, in part, be explained by the age of our patients (over 80% under 30 years of age) and their race (over 99%) were Negroes.[6]

The reactions encountered in our group of patients were mild in nature, consisting of urticaria and/or pruritus, observed usually within the first 5 days after injection of the drug. In all cases the skin manifestations responded promptly to the oral administration of antihistaminics and did not present a major problem. However, the second Bicillin injection was omitted in these patients. They were followed closely for several weeks, and none of them required additional antibiotic therapy.

The Bicillin used in our study is free of procaine. Therefore, eczematoid skin eruptions usually attributed to this component in other penicillin preparations[7] did not occur in our patients. The absence of procaine may be another factor explaining the low reaction rate in our patient group.

Local. Soreness and tenderness at the site of the injection were experienced by some patients, but this complaint became more infrequent as the technic of administration of the drug improved. Also, most patients would rather accept the passing local discomfort of the Bicillin treatment than the inconvenience of frequent clinic visits for repeated injections.

Comments

This study was primarily conducted with the purpose of initiating a workable program for the management of acute pelvic inflammatory disease in our ambulatory patients. This was facilitated by the use of a long-acting penicillin compound. In our patients Bicillin in disposable syringes was used exclusively. Each contains 1.2 mega units of N,N′-dibenzylethylenediamine dipenicillin G with 0.01% propylparaben and 0.09% methylparaben as preservatives. In most patients this amount provides average blood levels of 0.03 units per cc. for 2 or more weeks.[8] Since more than 90% of the gonococcus strains are affected by such low concentrations *in vitro*,[9] we assume that a single injection of 1.2 mega units effected a cure in most of our patients. If this is so, 100% of the 1,604 women with the preliminary diagnosis of acute pelvic inflammatory disease received a complete course of treatment.

A second injection of 1.2 mega units of Bicillin after an interval of 2 weeks is recommended for the following reasons:

(1) Eighty-two per cent of our infected patients presented themselves in the emergency room within the first 12 days of their menstrual cycle; this means that spreads were taken during the estrogenic phase when they are most likely to be positive.[10] If failure to demonstrate the gonococcus 2 weeks later is attributed to changes in the pH of the cervical mucus rather than to the disappearance of the germ, a second injection of Bicillin at this time should satisfy even the skeptical clinician.

(2) Prolonged adequate penicillin levels should provide penetration of poorly draining areas and a better chance for complete recovery.

(3) Long-lasting penicillin concentrations should protect the patient against re-infection and afford additional time to the physician who seeks to follow up on infected contacts.

(4) With 2 injections of 1.2 mega units of Bicillin, the patient receives not only prophylaxis, but adequate treatment for early syphilis, as indicated by other investigators.[4,11,12]

Summary and Conclusion

This study comprises a group of 1,604 patients with a presumptive diagnosis of acute pelvic inflammatory disease seen at the D. C. General Hospital during a period of 18 months (July, 1955 through December, 1956). All received initial treatment with 1.2 mega units of Bicillin in the emergency room.

About 40%, one-fourth of them "teenagers," were infected with gonorrhea. More than half the patients returned to our clinic for further evaluation and additional treatment.

Eighty per cent of the male contacts named were treated, one-fourth of them in our clinic.

Of those, 42 were relatively free of symptoms.

Advantages of Bicillin over short-acting forms of penicillin are discussed.

The reaction rate to Bicillin amounted to 0.5% and did not present a major problem.

We believe that a sizable contribution toward the control of gonorrhea could be made by finding and treating the male gonorrhea carrier. One approach to this problem is close collaboration of the venereal disease clinics with the gynecologists who treat unsuspecting females for the various manifestations of gonorrheal infection.

Addendum

The program for treatment of gonorrhea, as outlined in this report, is still being continued at our hospital. However, since January, 1957, Tubex injection Bicillin CR (Wyeth), has been in use. It contains 600,000 units N,N'-dibenzylethylenediamine dipenicillin G and 600,000 units procaine penicillin G in a stabilized aqueous suspension with 0.09% methylparaben and 0.01% propylparaben as preservatives in a volume of approximately 2 cc. It is more easily administered than the Bicillin previously employed, causes only minimal local discomfort, and produces higher initial penicillin blood levels. The patients treated with CR Bicillin seem to show a more prompt response to therapy. Side reactions, so far, have not been noted.

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CASE REPORT

Delayed Postpartum Hemorrhage with Afibrinogenemia

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ONE OF THE MOST DISTRESSING INCIDENTS that may confront the patient after childbirth and the obstetrician is delayed postpartum hemorrhage. Two cases of late postpartum hemorrhage with afibrinogenemia have been reported.[1] This is a report of a third case of delayed postpartum hemorrhage associated with a coagulation defect or a hypofibrinogenemia.

Case Report

E. G., a white 22 year old, gravida II, abortus I, was first seen in the office on December 16, 1955, with a chief complaint of hyperemesis. The last menstrual period was on October 19, and the estimated date of delivery was July 26, 1956. There was no history of a bleeding tendency. *Physical examination* revealed the uterus to be about the size of a 6 weeks gestation. The prenatal course was uneventful.

The patient was delivered on August 4, 1956, under pudendal block and Trilene anesthesia, by low forceps. The male infant weighed 3,460 Gm. The immediate postpartum course was normal; the mother and baby were discharged on the 5th postpartum day.

On the 7th day after delivery, the patient reported that her flow was "too heavy" and she was given Ergotrate tablets. The bleeding continued and she was readmitted to the hospital.

The B.P. was 110/70, P. 72, T. 98.4°. *Physical examination* revealed the uterus to be enlarged to the umbilicus. The Hgb. was 12.5 Gm., RBC 4.4 million, and the PCV. 32.

Treatment consisted of Pitocin drip infusion and Ergotrate by hypodermic. The uterus involuted satisfactorily and the lochia was normal. She was discharged in 36 hours on tablets of Ergotrate.

On the 10th day postpartum the patient had a sudden excessive flow of blood. She was advised to return to the hospital immediately. Upon this second readmission, the T. was 100.2°, P. 100, B.P. 112/70. The uterine fundus was 4 cm. above the umbilicus, and vaginal bleeding was profuse. The Hgb. was 8.8 Gm. and the PCV. 28. Five hundred cc. of blood was administered. A dilatation and curettage was done under Pentothal induction and cyclopropane anesthesia. The cervix was patulous and the uterus was enlarged almost to the xiphoid process and was filled with old clots and blood. A moderate amount of tissue resembling decidua and placental fragments was removed. During this procedure bleeding was profuse and a uterine pack was inserted. An ampule of Ergotrate was given I.V. and an additional ampule was placed in the second pint of blood. The hemorrhage then seemed to be under control and the patient was sent to the recovery room.

Her blood pressure and pulse were stable, and subsequently she returned to her room. At this time she received an additional 500 cc. of blood. Then she began passing a watery sanguinous discharge through the pack necessitating the use of some 12 pads. The blood pressure was normal. She was placed on penicillin and streptomycin and tetracycline orally. On the following morning the flow was excessive in spite of oxytocics. Since a blood dyscrasia was suspected, the following laboratory data was obtained: Lee and White clotting time was 13 minutes, capillary clotting 4 minutes 15 seconds, bleeding time two minutes, platelet count 409,050, prothrombin time was 13 seconds, or 100% of normal, the fibrinogen level was 85 mg. per 100 cc., RBC 4.05 million, Hgb. 10.9 Gm., PCV. 34, WBC 14,500 with a normal differential picture.

Two grams of fibrinogen was then given intravenously.[2] During the next 6 hours, the patient soiled only three pads and within 12 hours the lochia was normal. A second fibrinogen determination was 430 mg. per 100 cc. The uterus involuted rapidly and the lochia became scanty. The patient was discharged on the 16th day postpartum. The pathologic specimen consisted of grey pink tissue of a volume of about 5 cc. and was reported as decidual tissue showing necrosis, hemorrhage, and secondary inflammation.

At the end of 2 weeks, the patient was seen in the office, having stopped menstruating completely. The 6 week postpartum checkup was normal. She was seen again 3 months after delivery and pelvic examination was normal. The Hgb. was normal and her menses were regular and of normal flow. She had not shown any evidence of homologous serum jaundice.

Discussion

The patient was treated medically with oxytocics for excessive uterine bleeding when she was admitted on the seventh day postpartum. She was discharged after 36 hours

of observation. On the tenth day postpartum she was readmitted in impending shock; she was treated by blood transfusions, intravenous oxytocics, and a curettment plus packing of the uterus. Because of the failure of surgical management, a coagulation defect was considered and the blood studies were done. A fibrinogen level of 85 mg. per 100 cc. was discovered, whereupon 2 Gm. of fibrinogen were given intravenously, raising the fibrinogen level to 430 mg. per 100 cc. Almost immediately there was a dramatic change of the profuse sanguinous watery flow to a normal lochia.

Summary

1. A case has been reported of fibrinogen deficiency with late puerperal hemorrhage.

2. Only one report of two similar cases can be found in the American literature.

3. Fibrinogen deficiency must be considered in obstetric hemorrhage, regardless of the stage of labor.

4. Fibrinogen is now available and should be kept in all hospitals where obstetrics is practiced.

419 Jackson St.

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Central Dislocation Arthroplasty of the Hip*

HANES H. BRINDLEY, M.D.,† *Temple, Tex.*

The author describes his experiences with this type of operation for certain painful hips.

ALTHOUGH MANY SURGICAL PROCEDURES have been directed toward its correction, the painful hip remains a difficult problem. Pain, stability, and motion are the three factors to be considered in the surgical treatment of the hip, but the most important of these factors is pain. Various operations on the hip and the principles involved are reviewed in this paper. Also, my own experience with the central dislocation technic for arthroplasty of the hip, recently introduced by Charnley,[1-4] of Manchester, England, is presented.

Review of Surgical Procedures

By direct attacks on the nerve supply to the hip, attempts have been made to eliminate the pain in diseases of the hip. Injection therapy has had some use, but the results have not been satisfactory. Neurectomies, particularly of the obturator nerve as well as the nerve to the quadratus femoris and branches of the femoral nerve to the hip, have been employed. These procedures have not produced satisfactory lasting results, although they often do give some temporary relief of the pain. Capsulectomy has been performed in an attempt to denervate the hip joint; but, as a general rule, the results of this operation have been unsatisfactory.

The first actual mechanical change in the dynamics of the hip was that produced by osteotomy of the upper end of the femur. Many modifications of this type of osteotomy have been introduced. The first osteotomy probably was performed by Lorenz[5] in treating a congenital dislocation of the hip. Later this operation was modified by Schanz,[6] and this again was modified subsequently by Milch,[7,8] Blount,[9] Dickson,[10,11] and others.[12-16] Undoubtedly this type of osteotomy has a permanent place in the surgical treatment of the hip. In certain circumstances osteotomy can be utilized to restore function. One of the more popular procedures for osteoarthritis of the hip and also for nonunion of the neck of the femur is the displacement osteotomy of McMurray.[17,18] By shifting the weight-bearing line medially and changing the weight-bearing area of the head of the femur, pain of the arthritic hip often is relieved and the ununited fracture of the neck of the femur is stimulated to union. This type of operation is very popular in Europe and in the United States.

In the procedure of arthrodesis, motion is sacrificed completely in an attempt to relieve pain and gain stability. The main deterrent in this operation has been the difficulty with which the objective is attained. By contrast Girdlestone and Watson-Jones,[19] and Taylor[20] have sacrificed stability entirely and have produced a flail hip in an attempt to produce a painless and functional one. Mechanically, this seems a poor compromise; but, under certain circumstances, it still is a useful procedure.

There have been various reconstruction procedures, particularly for nonunion of the neck of the femur and avascular necrosis of the head of the femur. These operations include the reconstruction technics of Whitman[21] and Albee,[22] in which the head of the femur is sacrificed and the greater trochanter is displaced. Also, there are the reconstruction procedures of Brackett[23] and Colonna,[24] in which a rather reptilian type of hip is produced.

Undoubtedly one of the greatest contributions to the surgical treatment of the hip was that of mold arthroplasty introduced by

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Smith-Petersen.[25] Many satisfactory results have been obtained by this procedure and it is still a popular one. Rehabilitation of these patients requires a long time; often several operations are necessary to obtain a satisfactory result.

One of the more recent approaches to surgical treatment of the hip has been the replacement of the head of the femur by a prosthesis. Use of this procedure is limited. Probably it is worthwhile in the very old patient with a severe fracture high in the neck of the femur.

It is interesting to note that in these various surgical procedures on the hip, little consideration was given to the acetabulum. Sometimes the acetabulum was remodeled, particularly in the mold arthroplasty, and some in connection with prosthetic replacement; however, the actual mechanics of the acetabulum were modified very little.

Central Dislocation Technic

In 1948, Charnley,[1-4] first performed his central dislocation procedure on the hip. Basically, this procedure consisted of removing a portion of the floor of the acetabulum and producing a central dislocation of the head of the femur through this defect. For 6 weeks the limb was immobilized in a single spica. Following this time the patient was allowed to bear weight on the extremity.

This procedure afforded two mechanical advantages. First, there was medial displacement of the weight-bearing axis of the limb. This medial displacement was of such a degree that lever arm action in the neck of the femur, as occurs in the normal hip, did not remain. The second mechanical change was the marked stability produced by central dislocation. Abduction, adduction, and rotation were almost eliminated. Beside the mechanical advantages produced, there was real benefit in placing the relatively avascular neck and head of the femur adjacent to the vascular obturator internus muscle. Also, there may be a pain relieving factor in the removal of the abnormal subchondral plate of the acetabulum as well as the head of the femur.

By this procedure Charnley was seeking a more rapid and more certain method for arthrodesis of the hip. He found that although approximately one-half of the patients did not obtain solid fusion, nearly all of them had relief of pain. He has reported 158 cases, and follow-up ranges from one to six years. No deaths have occurred. Postoperatively, 2 patients developed infection, but good results were obtained. The over-all results were classified as *good* in 88%, *fair* in 9%, and *no improvement* in 3 per cent. Later, 5 patients developed fatigue fractures of the neck of the femur, but 3 of these patients had no symptoms. Five patients had mild deformities of internal rotation. Some of these deformities were corrected by subtrochanteric osteotomy. The best results in arthroplasty were obtained when the patient did not have more than 40 degrees of motion. This motion, of course, was limited to flexion and extension, there being practically no abduction or rotation. Several other British authors[26] have reported good results from using the central dislocation technic.

Personal Experience

During the past 18 months, I have used the central dislocation technic for treating 6 patients with osteoarthritis of the hip. Arthroplasty rather than arthrodesis was sought. The lateral, or Gibson approach was employed, and it seemed adequate. Cartilage was removed from the head of the femur and from the entire acetabulum. A defect then was produced in the floor of the acetabulum. In most instances this consisted of removing nearly the entire floor. The anterior superior weight-bearing portion of the acetabulum was so shaped that it would parallel the anterior superior weight-bearing portion of the head and neck of the femur. Central dislocation was produced and the trochanteric muscles were repaired under tension (Fig. 1).

FIG. 1

Central dislocation arthroplasty, 5 months postoperatively.

Postoperatively the patients were immobilized by means of bilateral boot casts connected with a cross bar. Initially the limbs were maintained in some abduction. Probably this was unnecessary, and so the last 2 patients were immobilized with the limbs in essentially neutral positions as far as abduction and rotation were concerned. Sitting up in bed was begun on the second or third day. By the end of the first week, the patient usually was sitting in a wheel chair for at least part of the day. This immobilization was maintained for 5 to 6 weeks. The patients then began weight bearing on crutches or in a walker, and by the seventh or eighth week the patients left the hospital, walking either with crutches or canes.

The early results in these patients have been very gratifying. Even during the immediate postoperative course, marked relief of pain was a striking feature. Rehabilitation, consisting only of ambulation with support as long as support was necessary, has been very simple. Extensive muscle re-education and strengthening procedures have not been needed. Compared with other methods for surgical treatment of the hip, the period of hospitalization has been comparatively short. If the patient had adequate care, probably part of the time the limbs are immobilized in the boot casts could be spent at home. Hospitalization could be shortened further by this means.

The first patient treated by this central dislocation type of arthroplasty returned to heavy labor 3 months postoperatively. He has continued to perform this heavy labor without discomfort. It is difficult to determine whether or not any motion remains in his hip. Charnley has stated that a number of his patients who originally had motion in the hip later obtained a solid arthrodesis. Certainly, a painless, stable arthrodesis is a satisfactory result.

One patient died from pulmonary embolism about 3 weeks postoperatively. At postmortem examination there was no evidence of undue bleeding about the operative site and it was established that this was not the source of the pulmonary embolism. The operative site was in good condition with the head of the femur resting on the obturator internus muscle.

In one patient the defect in the floor of the acetabulum was placed too low or inferior. Also, it was not large enough to accommodate the femoral head. Although the medial displacement and penetration were inadequate, this patient did obtain relief of his pain (Fig. 2). It is important, as Charnley has stressed, that the defect be anterior and superior in the floor of the acetabulum. In my experience it has been a continued temptation not to make the defect in the floor of the acetabulum large enough to adequately accommodate the reshaped head and neck of the femur.

The last 3 patients treated by central dislocation arthroplasty have obtained gratifying relief of pain, and the early functional results have been satisfactory. Thus far, motion in the hip has been maintained.

Summary

Again, let me say that the early results of this central dislocation type of arthroplasty have been very gratifying. The relief of pain has been satisfactory. Comparatively, the recovery from a major operation on the hip has been rapid. The rehabilitation has been sim-

FIG. 2

Inferior acetabular defect with inadequate medial displacement of the femur.

ple. I believe it will be a real addition to the armamentarium for surgical treatment of the hip.

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Discussion (Abstract)

Dr. P. B. Wright, Orlando, Fla. I wish to thank Dr. Brindley for presenting to us a most stimulating subject.

Charnley originally designed this surgical procedure with the hope of obtaining an arthrodesis of the hip, and later added compression for such a result. The operation provides a stable hip with little or no abduction and adduction motions and a medial shift of the weight-bearing line, all of which are most desirable should fusion fail to take place. Even though actual bony union may not take place, these hips are usually painless and the slight flexion and extension motions are an added asset. In other words, Dr. Brindley uses the operation as an arthroplasty.

Meticulous care is required to place the prepared cyclindrical femoral neck through a properly placed window in the floor of the acetabulum. The window must be sufficiently large to permit the central dislocation.

It is my opinion that this operation offers much for properly selected cases and the fact that it is still beneficial if bony union does not take place makes it doubly attractive. However, osteotomy of the upper portion of the femur, by some of the several good methods will, in my opinion, continue to be used and with satisfactory results.

Again, I wish to thank Dr. Brindley for keeping alive a very useful operative procedure that will permit some flexion and extension and still give relief of pain.

Dr. J. Leonard Goldner, Durham, N. C. The author describes a posterolateral approach for this procedure. We have used this approach on several patients and have found it unsatisfactory for several reasons. The anterolateral exposure is preferred because the direction of the drill hole in the acetabulum can be determined easier from the front than from the back. Also, there is less danger of injury to vital structures since the inside of the pelvis can be viewed readily through the anterolateral approach. The anterior iliac crest may be used as a source for bone grafting. If arthrodesis is decided upon, the alignment of the hip is determined easier with the patient flat on his back than on his side.

The author states that he does not trim down the head or the neck appreciably, and this would seem to be an advantage over the method described by Charnley, who cuts the head and neck down with a reamer which corresponds to the one used for drilling the hole in the acetabulum. Minimal trimming of the head and neck gives less chance for femoral neck fracture, which is a real and frequent complication. Also, the superior acetabular border should be trimmed in such a way that it is flush with the weight-bearing surface of the acetabulum and not concave as it is in the normal hip. This procedure, as an arthroplasty, has merit in the patient over 60 who has bilateral hip changes with severe pain. The procedure may be done in conjunction with, or following, intrapelvic obturator neurectomy.

The intrapelvic arthroplasty places the femur close to the midline, allows for a partial capsulectomy, gives more room to the incongruous surfaces of the degenerating femoral head and acetabulum, and still allows the patient maintenance of a reasonable degree of motion. If the arthroplasty alone is attempted, convalescence is fairly short and weight-bearing may be allowed in about three weeks. It is my opinion that this procedure, if used specifically for arthrodesis, should be done with a strong effort to attain fusion by the use of internal fixation, bone grafting and, if necessary, postoperative immobilization.

Clinical Pathological Correlation in Osgood-Schlatter's Disease*

IRA H. RAPP, M.D., and GORDON LAZERTE, M.D., *Charlotte, N. C.*

This represents an extensive study of the pathologic changes in the disease, casting some light on the pathogenesis of the condition.

THE CLINICAL FEATURES of Osgood-Schlatter's disease of the tibial tubercle are generally known and accepted, but the pathogenesis has been variously described. Three principle ideas concerning the pathogenesis are prevalent. The common textbook theory assigns the disorder to a primary aseptic necrosis or "osteochondritis" involving the developing tibial tubercle, and hence it is grouped in most texts with such lesions as Kienbock's disease of the carpal semilunar, and Legg-Perthes' disease of the proximal femoral epiphysis, implying a similar pathogenesis. A second hypothesis, supported by Cole,[1] proposes that the change is primarily one in the tendon with degeneration in the tendinous tissue, metaplastic ossification in the tendon, and secondary changes in the underlying tubercle. A third proposal supported by the detailed histologic study of Uhry[2] suggests that the entire lesion of Osgood-Schlatter's disease may be caused by traumatic avulsion of a part of the tubercle.

In a number of papers dealing with the subject of Osgood-Schlatter's disease no microscopic study of the lesion has been recorded. Notable exceptions are the papers of Cole[1] and Uhry.[2]

Seventeen patients from whom 19 lesions were examined histologically form the basis of this report. Ten of these specimens include a portion of the tendon with its "ossicle," while 9 include not only the tendon and its ossicle but also portions of the underlying apophysis. Several sections include a portion of the epiphyseal plate and adjacent metaphysis.

The duration of symptoms at time of operation varied from a few weeks to several years. All the cases are in male patients. All cases have in common not only a protracted course with symptoms unrelieved by conservative measures, such as restricted activity and immobilization, but also a similarity of roentgen findings indicating an intratendinous ossicle.

The normal development of the tibial tubercle has been described in previous reports and need not be reviewed here. Figure 1 diagrammatically illustrates the normal anatomic structure of the region in early adolescence and a comparison with the abnormal. The dotted lines indicate the area taken for pathologic study.

Clinical Features

The first x-ray evidence of the disorder is a soft tissue enlargement of the attachment

FIG. 1

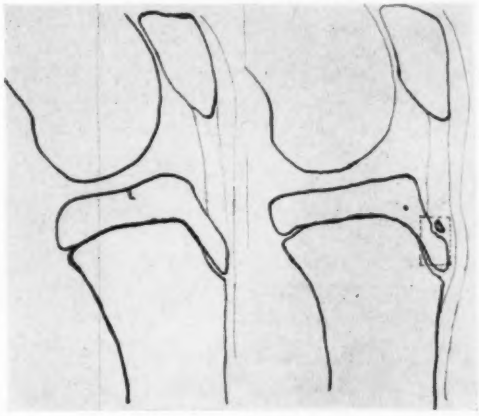

Diagram of region affected in the disease at about the age of 13. Bone outlined in heavy black lines; skin and patellar tendon in finer lines. Note that the tibial tubercle is formed by a beak-like projection of the proximal epiphysis of the tibia, separated from the metaphysis by a plate of cartilage. The rectangle in dotted lines indicates the area studied microscopically. (A) Normal. (B) Diseased.

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FIG. 2

X-ray study shows soft tissue enlargement over the tubercle, with widening and loss of definition of the patellar tendon shadow. The epiphyses are not fused.

of the patellar ligament (Fig. 2). Widening of the epiphyseal plate and/or irregularity of ossification of the developing apophysis are not diagnostic of Osgood-Schlatter's disease. X-ray evidence of soft tissue enlargement is followed by the appearance of a bony ossicle (Fig. 3). In the final stages these displaced fragments may undergo further growth by a process of "creeping substitution" and appositional bone growth. These enlarged ossicles persisting in adult life may be associated with increased intratendinous pressure and create disabling symptoms, when aggravated by excessive activity (Fig. 4).

The clinical symptoms of local pain in the knee aggravated by physical activity, and pain on direct contact are attributable to increased pressure in the tendon and may be correlated with the x-ray picture of tendinous swelling.

Pathological Findings

In the late stages a well-formed ossicle is found and no clues to its origin are evident. In early lesions the separate bodies in the tendons are composed of irregular fragments of partly necrotic bone and hyaline cartilage surrounded by callus. No residuals of hemor-

FIG. 3

Typical case, with soft tissue swelling and small separate ossicle in the tendon at its insertion. The epiphyses are not fused.

FIG. 4

Enlarged ossicle persisting in an older patient with fused epiphyses; note soft tissue swelling over the tubercle. Symptoms in this case required removal of the ossicle.

rhage, recent or old, have been encountered. In two of these cases the separate bodies were composed largely of cartilage.

In the specimens where the underlying apophysis is included with the tendon and ossicles, a defect can be demonstrated in the cortical bone of the apophysis directly opposite the separate fragment (Fig. 5). In this case the ossicle fits precisely into the underlying cortical defect. The separate fragment is partly or totally necrotic in many cases (Fig. 6). No evidence of necrosis is found in the underlying apophysis (Fig. 7). Some degree of active new bone formation surrounds the defect in every case, resulting later in eventual and complete repair of the cortical defect. In none of the specimens examined histologically was there evidence of pathologic change in the epiphyseal plate or underlying tibial metaphysis.

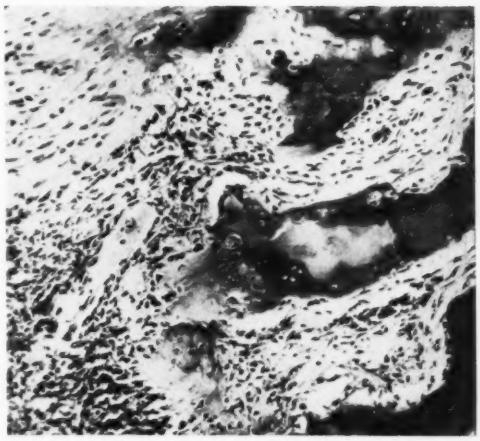
Discussion

Since neither necrosis nor degeneration was found in the tibial tubercle proper in any of the cases, the findings do not support the concept that Osgood-Schlatter's disease belong to the group of "osteochondritis juvinalis."

FIG. 5

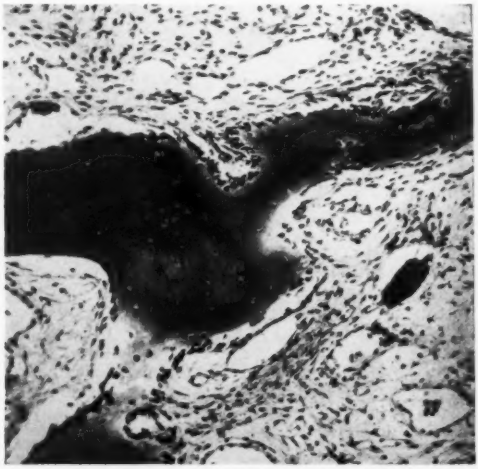
Low power (10 X) photomicrograph of insertion of patellar tendon into anterior surface of tibial tubercle, showing ossicle formed by avulsion of a small fragment of cortical bone. The epiphyseal plate is outside the picture, lying to the left of the field shown. (Compare with x-ray in figure 3.)

FIG. 6



Medium power (140 X) enlargement of portion of *avulsed fragment*, outlined in black on figure 5. Osteocyte nuclei are poorly stained in this field, indicating necrosis which is probably the result of interruption of the blood supply from the underlying bone. Very cellular granulation tissue is seen on the left side of the picture, and osteoid apposition by osteoblasts is visible at the end of the spicule in the center of the picture.

FIG. 7



Medium power (140 X) enlargement of tibial tubercle outlined in block in the center of figure 5. Note the clearly stained nuclei of the osteocytes, with no evidence of necrosis. The spicule is surrounded by active osteoblasts, and highly vascular cellular connective tissue fills the marrow spaces.

The common occurrence of necrosis in the ossicle in the tendon on the other hand is precisely what one would expect in an avulsed fragment of bone. There are no residues of hemorrhage in these cases, indicating that at the time of operation the separation of the fragment was well established and was not

due to recent acute injury. The orderly architecture of several of the relatively recently detached ossicles plus the corresponding defect with osteoblastic activity in the underlying surface of the tubercle, indicate that the ossicle is derived from the anterior surface of the tubercle.

The earliest clinical and x-ray sign of tendinous swelling at the insertion to the apophysis is a stress reaction created by, (1) physical overactivity, and (2) a rapid increase in linear skeletal growth. With increased and continued traction a fracture line is produced and the fragment gradually displaced, granulation tissue filling in the interval of displacement. Later the displaced fragment or ossicle may enlarge by continued bony proliferation.

Since the primary site of the lesion is only at the tendinous insertion, and a lack of evidence fails to support a degenerative phenomenon in the tubercle secondary to circulatory deficiency, it does not appear consistent to fuse surgically the epiphyseal plate or to promote circulation by drilling the developing apophysis.

Treatment in the early stages, before separation of the bone fragments, consists of restricted activity and/or immobilization by cast. Although the more advanced forms may respond to prolonged periods of immobilization, surgical excision of bony ossicles may become necessary. The cases in this study show that Osgood-Schlatter's disease is characterized by progressive avulsion of small fragments of the bony apophysis of the tibial tubercle. Individual susceptibility may be explained as noted above by, (1) a rapid increase in linear skeletal growth, and (2) sudden stress direct or indirect to the tibial tubercle, i.e., an accidental injury or fall from a height. The latter probably accounts for the prevalence in rapidly growing male children in the age group of 13 to 16 years.

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Discussion (Abstract)

Dr. J. F. Lovejoy, Jacksonville, Fla. I have enjoyed Dr. Rapp's scholarly discussion of this subject. I must confess that my experience has not had the benefit of microscopic examination. My clinical findings lead me to agree with Dr. Rapp in his evaluation of the pathologic process.

By the time the clinical symptoms have occurred, the condition is in a state of aggravation, not formation and the pain is secondary to the reaction of inflammation. Even in those with acute trauma, where an avulsion factor is present, I believe there has been a long-standing weakness.

The tissue being cartilage one would not expect any hemorrhage (this of course excepts acute trauma which we will exclude). The ossicle formation and the prominence of the tibial tubercle are, in my opinion, phenomena of growth and attempts at repair. In other words all the changes studied were old.

I am sure this is another manifestation of some generalized inadequacy, perhaps nutritional, but in any event little understood. Perhaps the discussion of this condition and its prevention belongs in the section of pediatrics.

One wonders if the study should go back to a detailed history trying to establish a pattern, nutritional for example and, with the pediatrician try and get sections, in the pattern group who die from other causes. Thus perhaps one could find out about some of the etiologic factors.

It is a pleasure to discuss Dr. Rapp's paper as I think it is a definite addition to our knowledge.

The Anesthetic Management of the Severely Burned Child*

D. LeROY CRANDELL, M.D., and
CHARLES E. WHITCHER, M.D.,† *Winston-Salem, N. C.*

In the burned child the physiologic processes are in precarious balance. The maintenance of this balance in terms of biochemical constituents is essential especially during anesthesia.

THE EVER PRESENT THREAT OF THERMONUCLEAR WARFARE gives added impetus to the resuscitative and anesthetic management of the severely burned child. Such a patient taxes his physiologic reserves to the utmost. The proper application of fundamental pharmacologic and physiologic principles in the management of the burned child may mean the difference between life and death. A thorough understanding of the vacillating biologic and biochemical responses to thermal injuries is essential in order to maintain the physiologic balance of the patient during anesthesia.

This report deals with the management of 11 casualties, ranging in age from 8 to 10 years, of a recent primary school fire. Three patients received outpatient care and 8 were admitted for hospital care. There were no deaths in this group (Table 1).

Upon the patient's arrival at the hospital the primary concern was the general condition of the patient and the need for supportive therapy. The treatment of the surface burn was of secondary importance. The first problem was to determine the severity of the burn and whether hospitalization was required. Children do not tolerate the initial trauma of burn well, and primary shock may develop with only 10% of the total body surface involved. The involvement of approximately 50% of the total body surface is usually associated with a 50% mortality rate.

For the administration of the initial fluids, a "cut-down" was done and a polyethylene catheter inserted into a superficial peripheral vein. This was done in preference to a venipuncture. While appropriate intravenous fluid was being started, blood was drawn for typing and cross-matching as well as for hemoglobin and hematocrit determinations. Prophylactic antitetanus serum and antibiotics were given also.

The "Rule of Nines" was used to approximate the extent of the body surface area involved by the burn.[1-3] The body surface area was apportioned as follows:

Head:	9%
Upper extremity:	9% each
Anterior trunk:	18%
Posterior trunk:	18%
Lower extremity:	18% each

Of the several formulas devised for fluid therapy, a slight modification of the Evans formula was preferred.[4] The total fluid replacement therapy during the first 24 hours was calculated by multiplying the body weight in pounds by the percentage of total of body surface involved. Of the total, 50% was given as colloid including blood, plasma, or dextran, 25% as isotonic saline, and 25% as 5% dextrose in water. Since the fluid shift during the first 8 hours is rather rapid, effective replacement required that 50% of the total fluid be given in the first 8 hours, and 25% in each of the second and third 8 hour periods. During the second 24 hours, the colloid and electrolyte quantity was half that of the initial 24 hours plus basal fluid and caloric requirements.

Following a severe burn, the reduction in circulating blood volume is primarily due to the loss of plasma into the burn area. Hemolysis and extravasation of blood into the burn area also contributes to the reduction in the

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TABLE 1

PERTINENT DATA

Case No.	Age (Yrs.)	Sex	% Burn	Anesthesia Time Hrs.	Min.	Number of Procedures	Mask	Endo	Via Trach.	Remarks
1	9	F	70	42	35	16	0	1	15	Hospitalized
2	10	M	60	31	45	11	0	1	10	"
3	10	M	60	14	55	4	1	3	0	"
4	8	F	50	8	20	3	0	3	0	"
5	10	M	30	10	20	3	1	2	0	"
6	10	M	30	6	15	2	0	2	0	"
7	10	M	15	3	30	1	0	1	0	"
8	10	M	15	1	25	1	1	0	0	"
9	9	F	5							Not Hospitalized
10	10	M	5							"
11	10	M	5							"
Total						—	—	—	—	
				Hrs.	Min.					
11 pts.				119	5	41	3	13	25	

circulating blood volume. Hypovolemic shock subsequently develops. The principal aim in giving fluids during the first 48 hours of the postburn period is to replace the circulating blood volume. Of the fluids available, plasma was the initial fluid of choice. Since hemoconcentration was already present, whole blood was not given until the normal hemoconcentration had been restored by plasma transfusion. If plasma was not available, dextran was the preferred substitute. Dextran, a polymer of dextrose, has proved to be an effective plasma volume expander. Dextran has been shown to produce fluctuations in the urinary specific gravity within an hour following administration. Readings as high as 1.055 may be seen within 30 minutes following the administration of dextran.

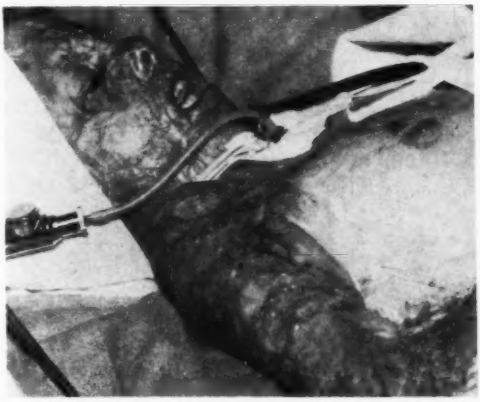
An indwelling catheter was used in the bladder, since the hourly urinary output provides a rough guide of the rate of fluid administration. During the first 24 hours, the urinary output was maintained between 30 to 50 cc. per hour. The rate of fluid administration was increased if the hourly urinary output fell below 30 cc. and decreased if it exceeded 50 cc.

Hematocrit and hemoglobin determinations provided additional confirmatory data as to the circulatory status. Whole blood was given to maintain a normal hematocrit. In severely burned patients in whom the measurement of blood pressure by conventional methods was impossible, a polyvinyl catheter was inserted into the femoral artery through a 17 gauge needle and connected to a modified aneroid gauge.[6] This gave an accurate determination of the mean blood pressure and aided in guiding the fluid and blood replacement to maintain a normal pressure.

Admittedly, the use of numerical formulas is a crude method of regulating fluid therapy, but it is also simple and applicable. The basis of fluid therapy depended on frequent clinical evaluation and on the response of the patient to therapy. The persistence of shock required the administration of blood or plasma. The restriction of fluid and salt would have been indicated if the patient had become edematous. The maximum fluid replacement was usually limited to 10% of the body weight regardless of the surface area involved by the burn. Restoration of normal physiologic function depends on the timely administration of the proper fluid in adequate amounts. No numerical rule replaced the clinical observation of the patient. However, these rules did serve as a rough guide on which to base fluid replacement.

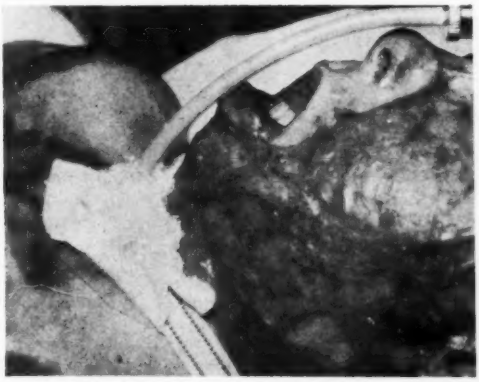
Concomitant with the replacement of the circulating blood volume, a clear airway with adequate alveolar ventilation was established in order to prevent the deleterious effects of hypoxia and hypercarbia. If edema of the glottis and larynx, or thermal injuries of the oronasopharynx precluded a clear airway, a tracheotomy was done immediately. Not only did a tracheotomy aid in maintaining a clear airway but it improved alveolar ventilation by reducing the dead space and facilitating tracheobronchial toilet. In second and third degree burns of the face and neck, a tracheotomy was frequently indicated. Cicatrical contractures of the neck which subsequently developed from third degree burns would have made endotracheal intubation difficult

FIG. 1



In second and third degree burns of the face and neck, a tracheotomy was frequently indicated to facilitate the administration of anesthesia.

FIG. 2



The cicatrical contractures of the neck which subsequently developed from third degree burns makes endotracheal intubation by the translaryngeal method difficult and hazardous. A tracheotomy solved this problem.

and hazardous (Figs. 1 and 2). A tracheotomy solved this problem for the multiple anesthetic procedures subsequently required. Infection and abrasion of facial burns by the anesthetic mask was not a problem with a tracheotomy available for the administration of the inhalant anesthetic agents (Fig. 3).

Acidosis, as a consequence of the marked electrolyte shift, almost inevitably appears after severe burns in children. With a decreased carbon dioxide combining power and plasma bicarbonate, there will be an associated disturbance in the carbon dioxide and oxygen transport mechanism. Respirations during shock are frequently shallow and must be compensated for to avoid tissue hypoxia and respiratory acidosis. The development of hypoxia and hypercarbia are potent factors in the perpetuation of shock. It cannot be overemphasized that it is mandatory to establish a clear and patent airway with adequate alveolar ventilation and to maintain a normal circulating blood volume for adequate tissue perfusion.

Hypoxia associated with increased capillary permeability, decreased plasma colloidal osmotic pressure, and inspiratory obstruction, with increased intrapulmonary negative pressure, will precipitate fulminating pulmonary edema. The required treatment is to secure a clear airway and to use intermittent positive pressure with oxygen to correct the hypoxia and reduce the pathologically elevated negative intrapulmonary pressure. Concentrated serum albumin or plasma is indicated to increase plasma colloidal osmotic pressure. Low Fowler's position and tourniquets on the extremities in rotation are beneficial in reducing thoracic venous pressure.

The treatment of restlessness due to cerebral hypoxia took precedence over other forms of therapy. Unfortunately this aspect is too frequently overlooked. Cerebral hypoxia in the severely burned patient is usually the consequence of a decreased circulating blood

FIG. 3

A tracheotomy obviates the danger of infection and abrasion of facial burns by the anesthetic mask.

volume or the impairment of respiratory exchange.

Most of the children that were severely burned did not complain of pain. The patients with extensive third degree burns were often lethargic and depressed. It was obvious that under these conditions the use of a narcotic, particularly in a large dose, was not only contraindicated but may actually have been detrimental by enhancing the depression of vital physiologic mechanisms that were needed to maintain homeostasis. Even initial debridement was quite painless except at areas adjacent to first degree burns which became tender within an hour. If the psychic reaction to pain, such as apprehension and fear, was predominant, a barbiturate often provided satisfactory sedation. Deep second degree burns required a potent analgesic agent to provide relief. Morphine (2.5 to 5 mg.) was the analgesic of choice because of its marked effect on the patient's reaction to pain. For all practical purposes Pantopon is nothing more than an expensive form of morphine with no special advantages over the latter. Dilaudid and meperidine were more effective if combined with a barbiturate than when given alone. It is generally recognized that irritation of the peripheral end-organs results in a pronounced lowering of the sensory threshold. This was seen after first and second degree burns. These factors reduced the threshold not only to cutaneous sensory stimulation but also to stimulation of deeper structures. The passage of a needle through skeletal muscle, which normally would cause minimal discomfort, then became severely painful. Even a procedure done under local anesthesia was often distinctly felt.

When narcotics were used for the relief of pain, small doses in dilute solutions given intravenously were often sufficient. Sustained relief of pain was provided by a 0.1% procaine drip or a narcotic drip (15 mg. morphine or 150 mg. of Demerol in 500 cc. of fluid). The absorption of drugs from the subcutaneous or intramuscular depot is grossly impaired by the reduced blood flow in the early postburn period. The absence of clinical effect within the expected time may lead to repeated injections. With the improvement in the peripheral circulation as a consequence of fluid replacement, the rapid absorption of large doses of narcotics will produce profound depression of vital physiologic mechanisms. Often restlessness and delirium were manifestations of cerebral hypoxia for which the depressant action of a narcotic was definitely contraindicated. If there was doubt as to the cause of restlessness, oxygen was given as a diagnostic test.

The need for relief of pain was assessed individually. Routine ordering of narcotics is haphazard therapy. Drugs which depress the cerebral cortex were used to manage apprehension, fear and hysteria. An intravenous injection of 50 to 100 mg. of pentobarbital or secobarbital was usually sufficient to produce psychic sedation. Overdosage of barbiturates can convert a state of hyperactivity due to apprehension and fear to a state of hyperactivity due to cerebral hypoxia. Since anuria or oliguria sometimes developed, the long-acting barbiturates, such as barbital and phenobarbital which are eliminated by the kidney, were avoided.

The selection of the anesthetic agent and technic is less important than the maintenance of light anesthesia with adequate alveolar ventilation. Severe burns produce renal and hepatic dysfunction. Coexisting hypoxia and hypotension enhance this impairment. Drugs and anesthetic agents dependent on hepatic detoxification or renal excretion were used in minimal hypnotic doses during the acute burn period. The sensitivity to thiopental is enhanced by the elevated blood urea and the altered cardiovascular hemodynamics. The elevated blood urea which results from the metabolism of protein into urea is due to an increased catabolism. In the presence of an elevated blood urea, a prolongation in the duration of unconsciousness will follow the administration of thiopental.[4] The increase in the duration of action of thiopental is roughly proportional to the blood urea level.

After the initial stage of acute burn, some form of basal hypnosis was necessary due to the need of multiple surgical procedures. A 5% solution of a thiobarbiturate using a dose of 3.5 mg./Kg. of body weight and given in a deep intramuscular site proved satisfactory for this purpose. Hyaluronidase was used to facilitate absorption. Adequate basal hypnosis occurred in 5 minutes and lasted approximately 2 hours. Scopolamine hydrochloride 0.4 mg. was given in combination with the thiobarbiturate. No evidence of tissue irrita-

tion was noted from this method. Intramuscular succinylcholine in a dose of 2 mg./Kg. of body weight and topical anesthesia with 5% Cyclaine or 2% Xylocaine were used to facilitate endotracheal intubation. Nitrous oxide analgesia was usually sufficient for changes of dressings and debridements. Nitrous oxide supplemented with cyclopropane, meperidine, diethyl ether or Fluothane furnished the additional analgesia required for skin grafts and plastic repairs. A nonrebreathing technic using a mask or endotracheal tube was preferred. In some instances cyclopropane or Fluothane were used with a semiclosed technic to fortify the analgesia maintained with equal flows of nitrous oxide and oxygen at a total flow rate of 4 L. per minute. Adequate anesthesia usually was attained with 0.6 to 1.0 volumes per cent of Fluothane delivered from a Foregger "copper kettle" vaporizer. Manual compression of the breathing bag was routinely employed to insure adequate alveolar ventilation by compensating the tidal volume.

Since Fluothane is a halogenated hydrocarbon, the possibility of hepatotoxic and cardiotoxic effects are potential hazards. A possible direct hepatotoxic effect has yet to be ruled out. The hypotension and cardiac arrhythmias observed with Fluothane are readily reversible by decreasing the concentration. Fluothane used to supplement nitrous oxide has shown great promise and deserves continued investigation. Proper and accurate administration by an astute anesthesiologist will do much to preserve the reputation of Fluothane as a safe and valuable adjunct to anesthesia.

Special consideration was given to the maintenance of effective alveolar ventilation to prevent hypoxia and hypercarbia. The marked electrolyte shifts and physiologic disturbances associated with severe burns will foster the development of hypoxia, hypercarbia and an elevated plasma potassium level. Sealy, Young, and Harris[5] have shown that the inhalation of carbon dioxide will produce a rapid rise in the plasma potassium level. A further increase results if the carbon dioxide is suddenly withdrawn. This is frequently associated with disturbances in the cardiac conduction mechanism and even ventricular fibrillation.

Conservation of heat was essential in these severely burned children. Light anesthesia did not seriously depress the temperature regulating center in the hypothalmus. Prolonged or deep anesthesia will depress the temperature regulating mechanism with conversion from the normal homeothermic state to the poikilothermic state; the production of vasodilatation of surface vessels will foster heat loss. Compensatory shivering in the immediate postoperative period will increase metabolism and oxygen demand. Shivering will also interfere with pulmonary ventilation and lead to hypoxia and hypercarbia.

Conclusion

The physiologic and biochemical disturbances in this particular group of severely burned children and their influence on the anesthetic management has been stressed. Light anesthesia without detrimental depression of vital physiologic mechanisms and adequate alveolar ventilation to prevent hypoxia and hypercarbia were of greater importance than any particular anesthetic agent or technic. Proper fluid replacement, effective pulmonary ventilation and rational pharmacologic methods of pain relief took precedence over the local treatment of the burn in the initial acute stage. During the course of anesthesia and surgery, the delicate physiologic balance of the severely burned child is maintained only by the constant attention of the anesthesiologist.

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Discussion (Abstract)

Dr. Sanford Cobb, Miami, Fla. I should like to compliment Drs. Crandell and Whitcher upon their broad approach to the severely burned child and his treatment. Certainly, almost all phases of treatment and anesthetic management have been considered. However, there are a few points which I would like to discuss.

In the description of fluid therapy during the first 24 hours, the authors state that the total fluid requirement is calculated by multiplying the body

weight in pounds by the percentage of total body surface involved. The implication is that this volume in itself is the grand total of all fluids administered in the first 24 hours; I suspect their true intent was to administer this calculated total in *addition to* the basal daily requirements of the child;—this, however, was not stated specifically. At the end of that same paragraph the missing statement appears, that for the second 24 hours, the calculated amount of special fluid (which is half the calculated amount given in the first 24 hours) is administered in *addition to* basic requirements.

If the only fluid given to the burned child in the first 24 hours were, as the authors stated, in the case of a 20 pound child suffering a 33% burn the total amount of fluid administered to him over the first 24 hours would be 660 cc., which I am sure everyone will agree would be inadequate. If we assume that this child is about one year old, I think it will be acceptable to suggest that a basal maintenance fluid regimen for this age and weight would be in the order of 55 cc. per pound per day, which is a total of 1,100 cc. per day. Of this 1,100 cc., 200 cc. should be normal saline (on the basis of 10 cc. of normal saline per pound of body weight) and 900 cc. should be 5% glucose in water. Adding the authors' calculated increment for the burned child of 660 cc., the fluid administered to a 20 pound child with a 33% burn would be 1,760 cc. in the first 24 hours, which seems reasonable.

I am in hearty agreement with the authors concerning their advocacy of early tracheostomy. As has been said many times previously by others, "the time to do a tracheostomy is when you first begin to wonder whether the patient might need one or not." This, however, does not mean to imply that tracheostomy is a benign procedure, for it certainly is not. Particularly in infants, tracheostomy not uncommonly produces unilateral or bilateral pneumothorax, which may be of the tension variety, and which, if not recognized immediately, may result in the sudden death of the infant. The incidence of this complication can be reduced in small children and infants by doing the tracheostomy over an endotracheal tube.

It is interesting to calculate the relative damage done by 1 mm. of tissue edema to the available cross sectional area of the airway in adults and children. Let us take as examples an adult with a trachea whose diameter is 2 cm., and a child whose trachea is 1 cm. in diameter. As the area of a circle is equal to *Pi* times the square of the radius, 1 mm. of edema in the adult trachea or larynx will reduce the cross sectional area of the airway from 3.14 cm.^{2} to 2.54 cm.^{2}, which is a reduction of 19 per cent. In the child, the cross sectional area of the airway, with a tracheal diameter of 1 cm., is 0.79 cm.^{2} One mm. of edema in the small larynx will reduce the effective cross sectional area of the airway to 0.50 cm.^{2} which is a reduction of 37 per cent. Therefore, 1 mm. of edema is essentially *twice* as effective in reducing the cross sectional area of the airway in children.

I have the impression that children in the early stages of a massive burn who present the picture of shock may well benefit from the administration of adrenal cortical steroids, in addition to all the other measures described in this paper. Hydrocortisone hemisuccinate (Solu-Cortef) is admirably suited for intravenous use in burned children who arrive at the hospital in a state of adrenal exhaustion from the stress of a massive burn.

The authors make a very good and very important point that hypoxia is very often a cause of restlessness in burned children. This often applies to more ordinary types of postoperative patients. It is regrettably common in every hospital for the nurse to administer an injection of morphine to the patient who is restless on the basis of hypoxia, and thus add insult to injury. Once hypoxia has been ruled out, it is wise indeed to attempt wherever possible to control apprehension *per se* with a barbiturate rather than with a narcotic. This, of course, ties in with the work of Harry Beecher on early care of wounded soldiers of World War II, when it was found that in many cases of severe wounds actual pain was minimal, and apprehension was the greater factor.

The use of intravenous drips of procaine or narcotics is rather elegant, but I would think that the use of any potent drug drip of this kind would demand the constant or relatively constant physical presence of a doctor, and would thus perhaps be somewhat impractical for care of large numbers of casualties.

My final comment concerns the authors' technic of premedication and induction of basal anesthesia later on in the hospital course of the severely burned child, after the acute phase of the trauma has been over. They describe their interesting technic of producing basal hypnosis with a mixture of 5% pentothal, hyaluronidase, and scopolamine by deep intramuscular injection. I would suggest that very often the use of the rectal route for the induction of basal anesthesia will save an already chronically traumatized child the discomfort of additional deep intramuscular injections with irritating solutions.

In closing, I would again like to compliment Drs. Crandell and Whitcher on their comprehensive and sensible discussion. This paper is an excellent clinical outline for the successful treatment of burned children.

CASE REPORT

Mycosis Fungoides: A Prolonged Course and Association with Adenocarcinoma of the Breast

R. L. BRIER, M.D., *Mobile, Ala.,* and C. H. STEELE, M.D.,† *Detroit, Mich.*

BLUEFARB AND COLLABORATORS[1] in their report of two cases of carcinoma and mycosis fungoides state that the association of carcinoma and lymphoblastoma of any type is rare. Skeer[2] reported a case of mycosis fungoides in a 58 year old woman who also had adenocarcinoma of the sigmoid colon, and says that there is little in the literature which associates carcinoma with mycosis fungoides. Hynes and Wintrup[3] reported a squamous cell carcinoma of the face in a patient who had mycosis fungoides. Beerman and Thomas[4] state that only rarely is mycosis fungoides simultaneously associated with other diseases.

The case reported here presents the combination of a 7 year survival in carcinoma of the breast with metastasis, and mycosis fungoides histologically proven for 17 years. The history of skin lesions dates back 38 years.

Case Report

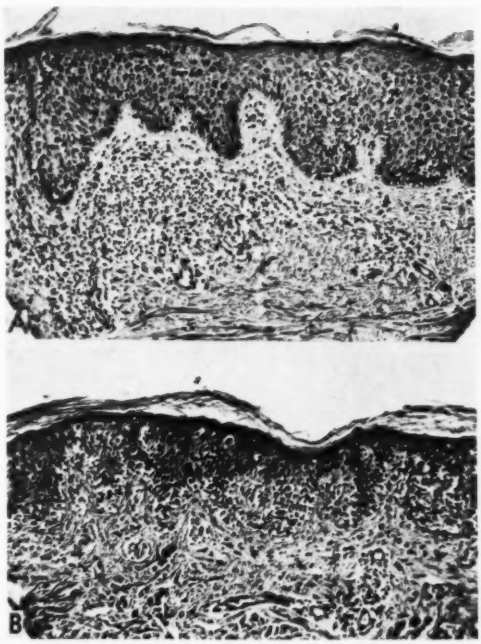
F. S., a 68 year old negress, was first seen at the Receiving Hospital of Detroit in 1939 at the age of 51. She had a generalized, scaly, hyperpigmented, pruritic eruption which had been present for 21 years. The eruption resembled parapsoriasis or a premycotic mycosis fungoides.

The biopsy showed: " . . . some keratosis. At one end of the section the epidermis is thickened, and in one small area there is considerable disorganization of the epithelial layer with intercellular edema and inflammatory cell infiltration. In the corium at this point there is a rather dense infiltration of mononucleated cells associated with a proliferation of fixed tissue cells—both endothelial and connective tissue cells. The subcutaneous zone is entirely normal." The histologic diagnosis was mycosis fungoides, premycotic stage.

The patient was seen in the outpatient department at infrequent intervals until 1951 when the skin eruption became worse. She presented the picture of lichenified infiltrated plaques scattered over the body. Some depigmentation was present where old lesions had cleared.

There was a tumor mass in the upper outer quadrant of the right breast; it was attached to the skin and underlying tissues and measured 7 cm. in diameter. Subclavicular and axillary lymphadenopathy was present. This tumor had been present 2 years. A right radical mastectomy was done on July 24, and a split thickness skin graft from the right thigh was used to cover the defect. The pathologic report was adenocarcinoma of the breast. On September 28, keloid formation was noted at the edge of the graft; this slowly enlarged and on November 26, 1952, the mass was excised. The pathologist's report was keloid tissue with no evidence of metastasis.

FIG. 1



Biopsy, (H & E) 90 X. (A) Specimen of February, 1953. (B) Specimen of June, 1953.

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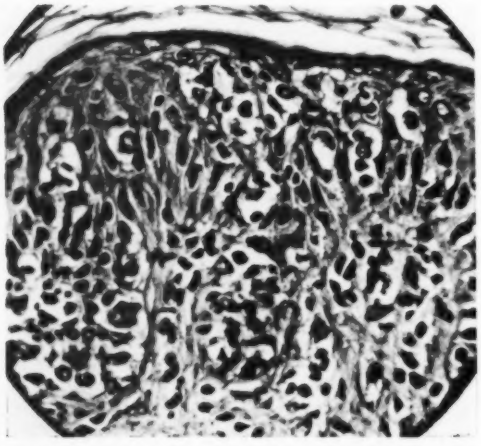
The patient was seen in the Dermatology Clinic at frequent intervals during this time. On August 31, 1951, she was placed on an antipruritic ointment and was improved for 3 months after which the pruritus became more severe. On February 8, 1952, she was given 10% urethane in syrup of glycerrhiza 4 cc. q.i.d. orally, and 1% salicylic acid in vaseline was used locally. Nausea and vomiting appeared during the first week of therapy and the dosage was therefore decreased to 4 cc. t.i.d. The gastrointestinal symptoms continued and a week later the urethane was discontinued. The pruritus having subsided, the local therapy only was continued. The course was satisfactory for more than a year. Then the plaque-like lesions and pruritus of the right side of the abdomen became severe, and in November, 1953, the patient was given 880 r of superficial x-ray therapy to the right side of the abdomen. The roentgen therapy produced marked improvement of both signs and symptoms. In November, 1953, she was found to have hypertension and cardiac decompensation.

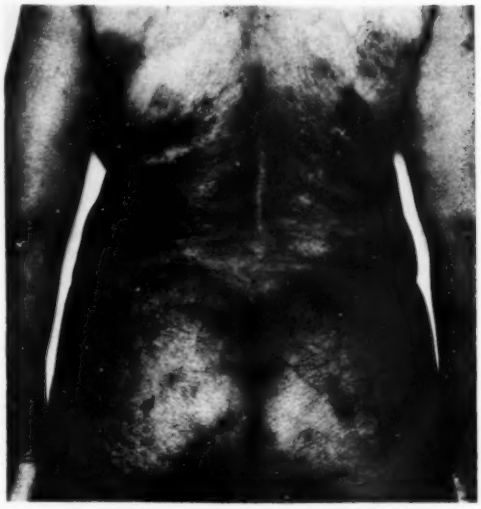
Skin biopsies on February 6, and June 8, 1953, examined by Dr. Hermann Pinkus were reported as follow: February 6, 1953 (Fig. 1, A). The epidermis is acanthotic and about twice as thick as normal. The rete ridges are uneven in size and shape and the dermal papillae are relatively short. There is spotty distribution of melanin in the basal layer with some melanin present in prickle cells. The stratum granulosum is present in some parts and absent in other parts of the sections, and there is spotty parakeratosis. Epidermal architecture is disturbed by the presence of numerous cells having fairly large dark nuclei and eosinophilic cytoplasm. The cells seem to lie in vacuoles between the basal cells and prickle cells either singly or in small groups. The subpapillary layer of the corium is edematous, shows increased vascularity, and contains a moderate amount of perivascular infiltrate. The cells are mostly small round cells, but some larger cells resembling those found in the epidermis are present. There are a few melanophages and mast cells, no eosinophils or plasma cells. The pars reticularis of the corium is free of infiltrate.

FIG. 2



Specimen of June, 1953, 400 X. This shows the histologic similarity to Paget's dermatosis.

FIG. 3



June 8, 1953 (Figs. 1, B and 2). The histologic changes are similar to those in the earlier biopsy. The epidermis shows pure hyperkeratosis without parakeratosis or loss of the stratum granulosum. The epidermis contains even more numerous extraneous cells. In some areas it is honeycombed by large afibrillar eosinophilic cells in a manner reminiscent of Paget's dermatosis. Cellular infiltrate in the corium is almost absent in some places, somewhat heavier in others. A fairly high percentage of the cells is a large mononuclear type resembling a reticulum cell.

Microscopic diagnosis. Reticulum cell type of lymphoblastoma exhibiting unusually pronounced epidermotropism: Epidermotropic Lymphoblastoma.

The patient continued in satisfactory condition until October, 1954, when she developed a nodule of the left lateral side of the body 3 cm. above the left iliac crest. The nodule was removed and the pathologic report was adenocarcinoma, metastatic to a lymph node. Therapy with stilbestrol 10 mg. t.i.d. was begun.

Because of the long history of the skin lesions the patient was purposely not given any radical therapy to the skin for fear that such treatment might upset the "ecologic" balance.

The patient developed a nodule in the right posterior axillary region beneath a keloid and this was removed on April 9, 1956, the pathologic report being carcinoma, anaplastic, involving the skin. During April and May, 1956, the patient was given 3,900 r to the right posterior axillary region.

Repeated x-ray studies of the chest and bones have been negative for metastasis. Blood counts have been

normal except for a mild hypochromic anemia in 1953 which responded to treatment. The skin eruption has shown little change over the past few years and today the patient has slightly infiltrated round, ovoid, and irregular outlined patches scattered over most of the body, especially the trunk. Mild lichenification is seen in some areas and hypopigmentation in healed areas (Fig. 3). The right breast has been removed and there are both keloids and nodular infiltrations in the right axillary region. She complains of pruritus and burning of the skin.

Summary

A case of mycosis fungoides of prolonged course and association with carcinoma of the breast with metastasis has been presented.*

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*This patient has been presented to the Detroit Dermatological Society on several occasions and was presented to the Central States Dermatological Association on April 14, 1956.

Southern Medical Association

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The General Practice of Pathology*

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IT IS BECOMING INCREASINGLY EVIDENT that pathology is rapidly approaching that stage in its development where no one individual will be capable of a complete mastery of the subject, and where specialization in specific subdivisions will occur. We are in the same position within this field, as was general medicine at the time of its fragmentation into the subspecialties of surgery, internal medicine, eye, ear, nose and throat, and the like. If one accepts the definition of pathology which has been adopted by the College of American Pathologists, one believes that, "Pathology is that branch of natural science which treats of the causes and nature of disease, together with the anatomical and functional changes incident thereto; the practice of human pathology is that specialty in the practice of medicine which may contribute to the diagnosis, treatment, observation and understanding of the progress of disease or medical condition in the human subject by means of information obtained by morphologic, microscopic, chemical, microbiologic, serologic, or any other type of laboratory examination made upon the patient or any other material obtained from the human body," and pathology immediately becomes a broad field in which are represented many subspecialties.

Some of these subspecialties in themselves require a lifetime of learning. In the past a pathologist was an anatomic pathologist with a rudimentary knowledge of the then limited field of clinical pathology. While anatomic pathology has been relatively static, clinical pathology has "grown like Topsy" in many diverse directions, and in this rapid growth has left the profession with areas of relative ignorance. These areas of new technics and philosophies can be filled only through adequate postgraduate education, an endeavor that takes time, money and effort. Our afternoon session is an example of one such effort toward the education of our membership in the field of radioisotopes.

At a recent speech, before a group of laymen, I tried to outline all of the facets of pathology in an attempt to define a pathologist. I became so fascinated by our versatility that I thought you might like to review them with me.

1. Anatomic Pathologist
   (a) Anatomist
   (b) Embryologist
   (c) Histocytologist
   (d) Histochemist
   (e) Forensic Pathologist

2. Clinical Pathologist
   (a) Chemist
   (b) Hematologist
   (c) Parasitologist
   (d) Physiologist
   (e) Immunologist
   (f) Physicist
   (g) Bacteriologist

3. We must also be a physician with a general knowledge of disease so as to serve as consultants to our clinical colleagues.

The time has come when pathologists must do one of two things. They must attempt to master all of the branches of clinical pathology plus pathologic anatomy, or they must delegate, in a satisfactory manner, well within the bounds of the ethical practice of pathology, those portions of their pathology duties which they themselves cannot master. This is rather easily solved in large institutions where "spheres of interest" can be filled by other pathologists within the same department. The problem child, as always, remains the "one pathologist" hospital which includes a large segment of our profession.

Any solution that is reached for this problem must, as was previously stated, remain within the ethics of the practice of medicine. I would like to quote from a statement made by Dr. Harry Smith, President of the A.S.C.P., in which he defines the practice of medicine, as the "sum total of the professional activities of individuals who undertake, or profess publicly to assume, responsibilities in the making of diagnoses of human disease, in prescribing therapy for human disease or in treating human disease. A licensed practitioner of medicine may not delegate the responsibilities incident to the practice of medicine but the services of unlicensed assistants may be used

*Chairman's Address, read before the Joint Session of the Southeastern and South Central Regions of the College of American Pathologists, and the Section on Pathology, Southern Medical Association, Fifty-First Annual Meeting, Miami Beach, Fla., November 11-14, 1957.

provided they work under close personal supervision of licensed physicians." A nonphysician worker does not have the essential background of medical knowledge to meet the responsibilities attendant to selection of methods and interpretation of results of procedures upon which are dependent the medical diagnoses of any given patient. But the services of these nonmedical specialists having a degree have become essential to the technical procedures involved. I personally feel there is a definite place, commensurate with his dignity and degree of training, for the nonmedical specialist within the framework of the well run pathology department. Where we have been remiss is in our failure to give them, and here I refer primarily to the Ph.D. specialists in the paramedical fields, the credit and financial remuneration that their training and graduate degree deserve.

In my own dealings with Ph.D. scientists, I have found both a willingness and a desire to work under the direct supervision of medical men, providing their own professional dignity is acknowledged. They can be of tremendous assistance to us in making available to our patients and physicians the best in clinical pathology.

The most constant argument against the use of such highly trained personnel is a matter of income. In the small hospital neither the work load nor the income warrants the use of such technical assistants. There are several possibilities which could be considered for solving this apparently insurmountable problem.

(1) As most of us know, we have been able to consolidate, in the form of community blood banks, processing and dispensing blood services for communities and even whole areas. This has resulted in better technical services being available to all hospitals and has further succeeded in reducing the cost of such procedures because of the bulk of work being accomplished. This same idea can be worked out between a group of small hospitals with regard to special technical services, and in some instances these special technical services can be combined in a single unit with the blood bank. This has the added advantage of providing a common carrier service between the central unit and the various hospitals. All specimens processed at the central diagnostic unit are sent by hospitals or individual physicians and the work is under the supervision of the pathologist. We have worked out such a system with regard to biochemistry in our own area and it is doing extremely well. We hope in the near future to make a similar pool of all special bacteriology. The financing of this type of "consolidated" program is something to be worked out between the hospitals concerned; our primary objective was to make available to all patients and doctors the best in diagnostic facilities, under adequate medical supervision. We have recently added our Ph.D. chemist to the consulting staff of our hospitals in order to recognize his standing in the medical community.

(2) Another way in which this problem could be approached is through liaison with nearby medical schools, through a "sphere of influence" plan. As most of you already know, one of the major problems concerning pathologists who are employed in teaching institutions, is the matter of inadequate income. A second is a loss of contact with the problems of the private practice of pathology, a loss that is eventually reflected in the philosophies of those young pathologists who are receiving their training in these "ivory towers" of learning. It is possible that their problems could be solved in the process of working out the small hospital "adequate diagnostic facility" problem with the following plan:

(a) The medical schools have the equipment for the more complicated diagnostic procedures. They have library and photographic facilities that are lacking in the smaller hospital units. They lack adequate money for salaries and they are devoid of areas of training where their pathology residents can be exposed to the private practice of pathology and its administrative and ethical problems.

(b) The hospital having a single pathologist has a good source of income and a need for some of the special services available at the medical school. I can conceive of a joint endeavor whereby there could be a mutually beneficial liaison, well within the limits of medical ethics. The arrangements would have to be such that the university pathologists could supplement their inadequate income by these consultation services, that the university could benefit by the utilization of its equipment and nonprofessional services, that the resident staff could benefit by the additional

field of knowledge thus opened to him, and that the hospital pathologist would receive for the patients under his charge, the best in diagnostic services. Such a system might eventually evolve into one whereby the pathologist "out in the sticks" could find time and coverage, through a locum tenen arrangement with the university staff, to return to the centers of learning for postgraduate study.

Whatever solution is chosen, the major consideration must be, as always, the welfare of the patients under our care.

Trichomoniasis: A Twenty-Five Year Study

KARL JOHN KARNAKY, M.D.,† *Houston, Tex.*

The author describes a new medication to be used as a vaginal powder and tablet which produces a low pH within the vagina and thus acts as a trichomonacide.

FEW PAPERS HAVE BEEN WRITTEN on the incidence of trichomoniasis, fewer on the pathogenicity of *Trichomonas vaginalis,* many on the therapy of infestation with the organism.

I have been actively and continuously studying the *T. vaginalis* since 1932, when I was a junior medical student. This was one of the first problems I investigated under the supervision of Drs. Willard R. Cooke, H. Reid Robinson, J. L. Jinkins, and George T. Lee of the Department of Obstetrics and Gynecology at the University of Texas School of Medicine (1932 to 1937). This study has been continued to date.

Clinically trichomoniasis may be associated with no leukorrhea ("dry vagina"), or with moderate to profuse, thick; moderately thick, or thin; whitish, grayish yellow or yellowish, (purulent) bubbly leukorrhea which scalds the perineum; or there may be no symptoms. Bubbly leukorrhea may occur in other vaginal infections, apparently due to the formation of gas by bacteria, accompanied by an intense itching and/or burning of the vagina and perigenital areas and of the external genitalia, or even marked excoriations of the perineum and inner sides of legs at the thighs. *This is the only leukorrhea whcih scalds the patient,* and the only condition accompanied by itching and/or burning of the vulva *just before, during or after menstruation.* The leukorrhea is often so profuse that on separating the labia, the area between the labial fold and introitus is found to be filled with a white to yellow thin or moderate creamy leukorrhea, regardless of how careful the patient has been in her vaginal hygiene. The vaginal wall is usually covered with the same secretion; the discharge usually accumulates in the posterior fornix of the vagina, especially if the patient has lain on the examining table for 5 to 10 minutes.

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After removing the secretion from the cervix with a cotton applicator, 15% of the patients show the small so-called "flea bitten areas" or "strawberry-like" spots, usually on the anterior wall of the cervix. Pathologically, on sectioning, they are minute ulcerations filled with small round cells.[1] Trichomonas may produce an acute, subacute or chronic vaginitis and cervicitis; in most patients the vaginal epithelium is not invaded, since the protozoan lives in the "moist layer" or "fluid layer" covering the vaginal surfaces.

T. vaginalis as an invader of the "moist layer" utilizes vitamins, trace elements, enzymes, protein, fats, and carbohydrates. It may live here as a harmless parasite producing no signs or symptoms. With an increase in numbers, or if the patient's resistance becomes lowered, it may irritate the vaginal epithelium.

Trichomonads swim in the "moist layer," absorbing and/or ingesting liquid foods apparently since I have watched them for hours and seldom are solid particles swept into their body, though I have seen a trichomonad engulf a white blood cell.

I believe the "red spots" in the vagina are caused by the "axostyle or tail" of the trichomonads, since it consists of chitinous or horny material; the "tail" is used to adhere to clumps of desquamated epithelial cells when the organism wishes to feed. They may stick the tail into the vaginal epithelium, producing the red spots possibly by toxins gaining access to a broken area in the epithelium.

T. vaginalis may be found in the vagina, Skene's ducts, bladder, kidneys, Bartholin glands, cervical glands, in the male genital tract, under the prepuce, on contaminated bath towels, douche nozzle and commode seats. It is transmitted through coitus with an infected individual. Several females in one family may become infected, one being infested and the others using the same bath

tub, towels and douche nozzle. Infestation may occur from lakes and ponds where contaminated individuals swim.

Infestation in Men

The male is most important as a source of this infection and reinfection.

Feo's[2] studies revealed that 144 or 926 men were infected with *T. vaginalis*, an incidence of 15.5%,—12% of the white, and 16.5% of the colored men. Of the 926 men, 246 were diagnosed as having nonspecific urethritis. The incidence of nonspecific urethritis attributed to *T. vaginalis* was 36.9 per cent. In our male clinics we have found over 200 men infected with trichomonads.

In my private patients, the male (husband or sexual partner) has been the chief cause of failure in treatment of the women. This was discovered in 1934 when it was found easy to destroy the trichomonads, but the recurrences were so common. I first had the husband use a condom at coitus and thus showed that recurrences did not occur unless they failed to carry out this instruction. (Since too many men will not and do not wish to use a condom, it has been found that if the wife would insert, 1 or 2 low pH (2.0 to 2.5) tablets* deep in the vagina immediately after coitus all trichomonads were destroyed, and the incidence of recurrences were greatly reduced.

It has also recently been discovered that if the wife will insert 1 or 2 low pH tablets deep in her vagina 1 to 2 times weekly, the cervix becomes covered with this low pH paste which is soft and does not interfere with coitus, but will destroy all pathogenic bacteria, fungi, trichomonas and spermatozoa. Then recurrences were almost nil.

Positive smears were found after prostatic massage and urethral milking, the secretion being examined immediately. More often when the secretion was cultured in Lash's medium, trichomonads have been found under prepuce of men whose wife's vagina harbored the organism.

Infestation in Women

The incidence of trichomoniasis varies according to the training one has had in looking for them in a fresh unstained vaginal smear and to the race of patient. Bland and Rakoff[3] report 23%, Greenblatt,[4] 16% in private patients and 24% in clinic patients; Karnaky[1] in charity clinics reported 37.5% in Galveston, and 27% in Houston. In 2,173 consecutive repeated fresh smears on 700 private patients, from January, 1944, through June, 1945, Karnaky[5] found 164 positive by fresh smear, a percentage of 23.42. There were 214 diagnosed clinically (30.5%), diagnosed clinically and also by fresh smear 147 (21%), not diagnosed clinically but by a fresh smear 17 (0.2%). These 17 patients did not have the clinical signs or symptoms of leukorrhea or pruritus vulvae, but did harbor the organisms. Moench[6] reported approximately 13% and Greenblatt[4] reported 66% in one series of 127 prostitutes and 51% in another series of 378 prostitutes.

Prostitutes may be the chief source of *T. vaginalis* in the single man who contracts the infestation, then marries taking the infection into his married life. The wife may be infected early in married life, but due to the normal virginal vaginal flora, pH 3.5 to 4.2 the trichomonads do not survive. When the vaginal pH becomes 5.0 to 6.0 they may not produce signs or symptoms, but live as a harmless parasite in the "moist layer" covering the epithelium. Too frequent coitus and/or too frequent douching with a noncorrected acidic, non-buffered, a nonphysiologic douch may lower the vaginal resistance to the trichomonads.* They may then multiply and produce the signs and symptoms of vaginal trichomoniasis. Or, the husband may be infected by extramarital coitus and then transmit the infestation to his wife. This infection may upset a married couple's life because of troublesome dyspareunia, soreness and painful coitus. This may lead to even more extramarital exposures for the husband and he may carry *Candida albicans, hemophilus vaginalis* as well as new strains of *T. vaginalis*. I have inoculated *T. vaginalis* which produced a great deal of itching in one woman into the vagina of another woman (a volunteer) who had asymptomatic trichomoniasis and have produced the same intense itching and burning. Conversely, trichomonads from asymptomatic infestations inoculated into another woman usually produced no symptoms.

*Trimagill

*A good reasonable (in cost) correctly buffered and acidic douche is Massengill Douche Powder. It can be obtained in all drug stores in America.

Pathogenicity

In 1933, Cooke and Karnaky[7] inoculated vaginas free of *T. vaginalis* with mixed cultures of bacteria and trichomonads and produced all the signs and symptoms of vaginal trichomoniasis. In the inoculation with *T. vaginalis* it was found the infection took place more often if the patient was menstruating, or if the cervix was cut or abraded with the teeth of a uterine tenaculum and permitting the area to bleed for a few seconds. In no cases were inoculation successful if the vagina contained a normal vaginal pH of 3.5 to 4.2.

It is my opinion that the ejaculation of semen (protein, carbohydrates, fat trace elements, enzymes, etc.) in the vagina offers a favorable media for the growth of *T. vaginalis*, candida, *H. vaginalis* and other pathogens already in the vagina. This may lead to such increased numbers of trichomonads that itching, burning and leukorrhea develop. Friction, irritating the vaginal epithelium (pouring out of serum), aids in increasing the number of trichomonads.

In 1934, it was observed that in mixed cultures of vaginal bacteria and *T. vaginalis*, the trichomonads died out in 24 to 48 hours if not subcultured, though the bacteria lived on and multiplied; that if the mixed cultures were suddenly brought to near freezing, the trichomonads died within 5 to 10 minutes, but the bacteria lived and multiplied when the temperature was brought back to room temperature within 5 to 10 minutes; and if the mixed cultures of bacteria and trichomonads were warmed to a certain temperature, the trichomonads died but the bacteria lived and multiplied. These bacterial cultures from trichomonal infested vaginas have been inoculated into a large series of vaginas free of trichomonads during the past 25 years. Signs or symptoms of vaginal trichomoniasis were not produced. In a few cases a slight excess of grayish vaginal leukorrhea, like that seen in *H. vaginalis* infection was produced but cleared up in 4 to 6 days without treatment. These experiments even in 1934 convinced me that *T. vaginalis* is pathogenic despite many who have considered it to be a harmless parasite.

Diagnosis

Vaginal trichomoniasis is suspected when there is a history of a profuse thick or thin, grayish or yellowish white, or yellow leukorrhea causing itching and burning, especially just before, during and just after menstruation. It itches more during the daytime; the leukorrhea scalds the external genitalia, a characteristic only of this infestation.

There is an excess of the discharge between the labial folds at the introitus; there may be acute to subacute redness or no redness of the inner aspect of the labia and hymen. Brownish excoriation of the perineum for a varying distance is due to the profuse leukorrhea spreading over the perineum. The vagina may appear normal in most instances, or there may be acute to subacute redness of the epithelium, and edema; or the walls may be covered with an excess of the discharge described, with a pool in the posterior fornix in the supine position. The small, red, "flea-bitten-like areas" on the anterior wall and face of the cervix have been described above. These areas bleed at the slightest manipulation even with cotton applicators.

Microscopic examination must confirm the diagnosis. Two cotton applicators are slowly and gently inserted deep into the vagina and turned around several times. Or a dry vaginal speculum is inserted slowly to expose the cervix; the posterior wall of the cervix and the walls of the vagina are gently swabbed with two cotton applicators. As much secretion as possible is collected on the two cotton applicators and placed in a test tube containing 0.5 cc. of normal saline. In the laboratory it is placed in a jar of warm water at room temperature.

It is better to examine the smear as soon as it is taken. Three-fourths of the surface of a clean slide is covered with a thick layer of the secretion mixed with just enough of the saline to remove the secretion from the cotton applicators. The smear should be examined under the dry low power lens, the substage light being cut down until the microscopic field becomes slightly darkened. The typical clear motile flagellates are then observed moving about among the debris in the secretion. High power microscopy may be necessary. Tap water may be used instead of saline if the secretion is to be examined immediately. We have observed that if, to the two applicators in 0.5 cc. normal saline a drop of human serum is added, the trichomo-

nads will multiply very rapidly at room temperature and will live for 24 to 48 hours. Thus, if saline and human serum are used one may examine a smear at one's convenience.

Treatment

There is no cure-all. In a 25 year study of this protozoan, the following have been used in therapy: silver picrate insufflations and suppositories, ozonide of olive oil, vioform, sulfathiazole, beta lactose, glucose lactose, sucrose, saccharose, maltose, salicylic acid, carbarsone; most have been advocated in the medical literature.

Careful scientific studies have been made on this subject during the past 25 years. Thousands of "electrical" and "electronic pH" determinations, and glycogen determinations of the vaginal epithelium have been done in my laboratory. More than 3,000 clinic patients have been treated in the Jefferson Davis Hospital and in my own research clinic; I have treated more than 2,000 private patients with *T. vaginalis*. From this 25 years of continuous study of the leukorrheas, I have developed a new method whereby the pH of the vagina may be kept at pH 2.0 to 2.5, without this acidity burning the vagina and perineum, but destroying *T. vaginalis, Candida albicans, H. vaginalis,* and other pathogens. Also, new adhesives cause the vaginal and cervical medications to adhere and to remain adhered to the vaginal walls thereby eliminating the leakage and messiness of the previous medications used in the vagina. No vaginal pack or external pads are now necessary.

The "new low pH powder, tablet and jelly" contain the following:

Buffers—potassium bi-hydrogen tartrate, potassium aluminum sulfate, citric acid, boric, di-hydro-succinic acid; *Wetting and Detergent Agents*—oxides of iron, aluminum, silica, and magnesium, potassium aluminum sulfate: *Doderlein Bacilli Media*—(normal vaginal microorganisms food) dextrose, complex carbohydrates; *Filler, Adhesive and Binder*—hydrous aluminum silicate.*

The plastic squeeze powder blower holds 5 ounces. The pH is 2.0 to 2.5. It is nonallergic and nontoxic. It will not leak or drain from the vagina and is nonodorous.

*Patent pending.

INSTRUCTIONS.

At the Office. The physician may use the "new low pH powder," after opening the vaginal vault with a vaginal speculum, by pressing on the plastic bottle, thus blowing the powder into the vaginal vault and over the vaginal walls and cervix. The vagina may be filled to one-half to three-fourths or to complete filling. As the speculum is withdrawn from the vagina a large cotton plug, held in a uterine dressing forceps, wipes off the excess and loose powder from the posterior blade of the speculum at the introitus and pushes the powder back and deeper, gently packing it in the vagina. The excess and loose powder on the cotton plug is wiped, dusted and rubbed over the perineum, into the pubic hairs and between the labia. Additional powder is blown or dusted over perineum and between labia. This procedure is carried out in the office every 2 to 7 days for three to six treatments, or until the vagina and cervix are well. A thin white membrane may form in the vagina in a rare patient but is of no importance.

No vaginal or introital pack or packs, or external pad are necessary since the powder adheres to the vaginal walls so well it will not run from the vagina onto the perineum. The powder remains within the vaginal vault and on the vaginal walls for two to seven days. Since it is very soluble in the vaginal fluids and warm water, it is easily douched out with warm buffered acidic low pH (2.0 to 3.0) douche.

At Home. The patient inserts one to two Trimagill tablets nightly for 7 to 21 days. After the office and home treatments have been finished, the patient blows or pushes the powder into the vagina, or inserts one Trimagill tablet every 2 to 5 days, usually 1 tablet weekly, for years. By blowing in the low pH powder or inserting a tablet into the vagina every 2 to 5 days, the physiochemical (normal physiologic) characteristics of the vagina are kept at a normal state. No pathogenic microorganisms can live or grow when the pH is within the normal range of 3.5 to 4.2, and especially if below the normal pH which is attained by the powder. The low pH stimulates the vaginal epithelial cells to grow back to their normal height, as shown in experiments by Bradbury and Karnaky[8] on vaginas of castrated guinea pigs. The low pH

of 2.0 to 2.5 is attained in the vagina within three minutes after the powder is blown in.

The patient blows in the powder by inserting the barrel of a contraceptive applicator as far as it will go in the vagina. It is then pulled back about an inch to create a pocket into which the powder is blown. The barrel is again pulled out for about a half inch and again the powder blown in. This is repeated over and over until the vagina is completely filled or enough of the powder has been placed in the vagina.

The plastic bottle fitted to the contraceptive barrel is shaken or jarred so the powder may fall down to its opening attached to the tip. Quick and firm pressure on the plastic bottle two to four times usually fills the vagina almost immediately, the excess powder rushing out of the vagina around the barrel, and thus there is no danger of blowing powder into the cervical os. By holding the fingers of one hand around the barrel as the powder is being blown into the vagina, loose powder is blown out and around the barrel is dusted on and into the perineum, between the labia and around the anal region. The powder has a powerful deodorant effect. An acid douche at coitus is followed by the insertion of another Trimagill tablet. The treatment with powder or the insertion of one or two tablets every 2 to 5 days is advised when she is not menstruating.

During the menstrual flow such treatment is carried out four to eight times daily. The patient blows or pushes in the powder and/or tablets as often as necessary to change the menstrual flow into a grayish sand-like material. A burning sensation in the vagina means the treatment is too frequent and needs to be reduced. Such therapy drops the menstrual blood pH of 7.2 to 7.6, to a pH of 2.0 to 2.5 within three minutes. All pathogenic microorganisms are killed almost immediately due to the drying of the vaginal wall and the low pH and to the chemical changes of the blood.

As stated the menstrual flow is kept to a grayish sand color. Menstrual blood on the perineum is changed into a grayish sand-like material by the powder and is easily dusted off as the patient sits over the commode. The menstrual blood thus changed shrinks so little or none of it passes into an internal tampon or onto an external pad, and in most patients with a normal cycle, neither tampon nor pad are necessary, and usually the number of external pads are reduced by 50 to 75 per cent. In patients who spot for two or three days, the powder usually eliminates this. If there is menorrhagia and blood reaches the perineum, more powder must be blown into the vagina and onto the perineum, or a perineal pad must be worn. If a pad is to be worn, it is opened and a liberal amount of the powder is placed between the layers in the pad and then it is folded back together. Then an excess amount of powder is placed between the pad and the vulva. The loose powder so placed stops odors, absorbs and changes the blood into a dry sandy powder, as well as killing pathogenic microorganisms on the perineum and the menstrual blood. Enough powder must be used to change the blood into the sandy substance.

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EDITORIALS

THE RATIONAL MANAGEMENT OF ADENOMATOUS POLYPS OF THE RECTUM AND THE COLON

Early detection and treatment of cancer is a great challenge to the medical profession, but the ultimate ideal is the diagnosis and proper treatment of potentially malignant disease processes before invasive malignancy has occurred. Adenomatous polyps of the rectum and the colon offer one of the few opportunities encountered in medicine today to eradicate potentially malignant disease before it has become frank cancer. The management of adenomatous polyps of the rectum and the colon is receiving much attention in the literature at this time and the proper surgical therapy is a much debated and controversial question.

The relationship of adenomatous polyps of the rectum and the colon to carcinoma of these organs is now well documented. There is abundant histologic evidence showing that adenomatous polyps may undergo malignant change and that most, if not all cancers of the colon and the rectum originate in a pre-existing polyp.

Multiplicity of adenomatous polyps is an important factor in the management, and it is becoming apparent that the incidence of multiple lesions is greater than previously appreciated. Similarly, there may be multiple cancers involving the large intestine in a surprisingly high percentage of patients. This has led some surgeons to advocate extensive and radical surgical procedures as a prophylactic method of treatment of polyps. Others have taken the opposite stand and advocate the most minimal procedures unless frank invasive cancer is present.

We have recently reviewed a representative series of patients with adenomatous polyps of the rectum and the colon in which conservative treatment was employed. Histologically, 40% of these polyps had evidence of some malignant change, but only 10% were found to have invasive carcinoma. Almost two-thirds of the polyps were within reach of the proctosigmoidoscope and all of these were totally excised by snare or biopsy forceps followed by electrodesiccation. Those polyps lying above the peritoneal reflection were treated by colotomy and polypectomy except for a few instances in which there were clusters of polyps for which segmental resection was done. For those polyps showing malignant invasion of the pedicle, by frozen or permanent sections, either immediate or subsequent segmental resections were performed. Careful follow-up studies have revealed gratifying results. In none of the cases of adenomatous polyps has there been a death due to cancer.

With this review in mind we have formulated what we believe to be a sound and logical approach to the management of adenomatous polyps of the rectum and the colon consistent with our present knowledge of this disease.

1. All polyps of the rectum and the colon should be removed.

2. Adenomatous polyps below the peritoneal reflection may be excised locally by snare or biopsy forceps followed by electrodesiccation.

3. For adenomatous polyps above the peritoneal reflection, exploration with colotomy and polypectomy should be done. Total coloscopy through multiple colotomy incisions should be done at this time.

4. If there is histologic evidence of malignant invasion of the pedicle or base of any polyp, an operation for cancer should be done.

5. Segmental resection should be performed for small clusters of polyps or several polyps in the same area.

6. All patients with polyps should be followed closely by means of routine proctosigmoidoscopic examinations and radiographic studies of the colon for the remainder of their lives.

ROBERT A. MCGREGOR, M.D.,
and
CURTICE ROSSER, M.D.

STAPHYLOCOCCAL INFECTIONS IN HOSPITALS

Since the introduction of antibiotics an increasing proportion of staphylococci isolated from nasal carriers and from infections in hospitals have been antibiotic-resistant. Most staphylococci isolated from persons in hospitals today are resistant to penicillin, streptomycin, and tetracycline, and may be resistant to erythromycin and chloramphenicol if these antibiotics have been used extensively. By contrast, staphylococci isolated from infections outside the hospital are generally drug-susceptible.

The use of antibiotics in hospitals, either prophylactically or in the treatment of infections, eradicates the drug-susceptible staphylococci in the nose of hospitalized patients and permits their replacement by drug-resistant staphylococci from the hospital environment.[1] From these sites the resistant staphylococci slowly are spread to untreated patients and hospital personnel, and eventually are responsible for severe and often fatal infections. Associated with the selection of drug-resistant strains has been the selection of a few staphylococcal phage types, so that infections acquired in hospitals are almost always due to staphylococci of phage group III or phage type 80, 81.

The prevalence of staphylococci with these characteristics has been one factor which has prevented the prophylactic use of antibiotics from being effective. Although infections due to pneumococci and group A beta hemolytic streptococci can be prevented, the total incidence of infections is often not reduced, and the infections which do occur are more difficult to treat because of the drug-resistance of the staphylococci and gram-negative organisms causing infections in patients on prophylactic antibiotic therapy.[2]

In addition, drug-resistant staphylococci of phage type 80, 81 have been responsible for several severe epidemics particularly in nurseries.[3] Although it is not known if epidemics would be less frequent if susceptible staphylococci were the predominant organism, the property of drug-resistance has limited the effectiveness of antibiotics in the control of the epidemics which have occurred.

Attempts to control staphylococcal infections in hospitals should include measures to prevent dissemination of resistant staphylococci in the hospital and to prevent infections by either resistant or susceptible strains.

Since the frequent use of antibiotics is responsible for the dissemination of resistant strains among hospitalized patients, a reduction in the use of an antibiotic should be followed by a reduction in the proportion of staphylococci which are drug-resistant. Restriction of the use of erythromycin in a hospital has been followed by a reduction in the number of strains resistant to erythromycin.[4] Certainly the use of antibiotics to prevent infections should be carefully controlled, since prophylaxis is frequently ineffective.

The prevention of infections due to either resistant or susceptible staphylococci is more difficult and depends in part upon the use of aseptic technics in areas where patients are particularly susceptible to infections. Many of the epidemics in nurseries or as postoperative infections have been traced to a relaxation of the usual aseptic technics. On other occasions personnel with minor staphylococcal infections or carriers with heavy nasal contamination have spread their organisms to patients, and infections have occurred despite usual care. The removal of personnel who were infected or who were heavy carriers to other areas, and the institution of more thorough aseptic technics have been successful in controlling several epidemics in nurseries. In still other nursery epidemics staphylococci were spread from infant to infant, and the epidemics subsided only when the nursery population was low.

Several minor procedures, such as aspiration of effusions, intravenous cannulations,

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or intramuscular injections have been portals of entry for fatal staphylococcal infections. The advent of antibiotics has not permitted the relaxation of aseptic technics, and hospital personnel should be aware of the potential hazard of many of the minor and usually uncomplicated procedures which are performed in hospitals.

MR. LORANZ RECEIVES HONORARY DEGREE

Mr. C. P. Loranz

The Southern Medical Association is pleased to announce that Mr. C. P. Loranz received an Honorary Degree of Doctor of Science (D. Sc.) from Erskine College in Due West, South Carolina during its 116th commencement held in Memorial Hall on the campus at 10:30 a.m., June 2, 1958.

A citation from the Board of Trustees of the College was read preceding the conferring of the degree and referred to Mr. Loranz as "the greatest layman in the history of American Medicine."

Erskine College, founded in 1839, is a co-educational college and seminary of the Associate Reformed Presbyterian Church. In conferring this degree, the College is recognizing Mr. Loranz' contributions to medical progress through his services to the Southern Medical Association. This recognition has added significance since he is an active Presbyterian, having been a church officer for more than fifty years and is now the Senior Elder in his church in Birmingham.

Mr. Loranz began his career with the Association in 1912 in the capacity of Business Manager. In 1921 he was elected Secretary, Treasurer and General Manager with the title of Secretary-Manager. Since 1954, he has served in an active advisory and professional relations capacity and is now in his forty-sixth year of service.

Thus, as Erskine College honors this dean of medical society administrators, it is honoring by indirection the Southern Medical Association and the physicians of the South in whose behalf this distinguished career has been pursued.

V. O. F.

The President's Page of the Woman's Auxiliary

The Book that is the acknowledged best seller of all time, states that "From the fullness of the heart the mouth speaketh." Just now, the President of Southern Auxiliary is so full of appreciation and approval concerning the state Auxiliary Conventions she has recently attended that she has a compulsion that is irresistible to write about them.

CONVENTION HIGHLIGHTS—Fundamentally, all Conventions were similar. In detail, each showed spontaneous individuality. All highlighted Southern's two pre-eminent

Mrs. Walker L. Curtis

projects—Doctors' Day and the Research and Romance of Medicine.

Reports showed that in the light of the present sweep of heart disability, among overtaxed professional men, the observance of DOCTORS' DAY as a time of relaxation and especial appreciation for those "Meritorious Men of Medicine"—our Doctors—is taking on added seriousness of purpose. Public proclamations, newspaper editorials, window displays exhibiting medical progress, Sunday-church recognition, week-end camps, fishing parties, picnics, luncheons and banquets featuring skits, humorous speeches, sleight of hand performances, hobby shows, fellowship and food, have all come in for an entertaining share in the observance of this important day.

With so much misconception of Southern tradition and purposes, coming from areas outside the South, it is heartening to note the renewed interest being shown in putting forth facts relative to the vast scientific contributions made by Southern men of medicine. Auxiliaries are asked to stress more and more this most fundamental feature of the Auxiliary of the South—the RESEARCH AND ROMANCE OF MEDICINE.

The third, and perhaps happiest function of Southern, FELLOWSHIP, was everywhere in ebullient evidence. According to circumstances and locations, there were garden tours, patio parties, receptions, coffees, teas, dinners and the ever-enjoyable fashion shows with their intriguing ensembles, their bustled bouffants, slinky sheaths, subtle sacks and shapeless chemise. All of which made one rejoice in the beauty and grace of others and thankful that "to follow suit" is not essential.

It was most gratifying to observe the splendid LEADERSHIP displayed at all Conventions. We have long noted that doctors' wives are a bit special, due to the wise judgment of the profession in the selection of companions. This fact was fully proven by the poise and ability of presiding officers, the charm with which greetings were extended, the impressively intelligent manner in which officers and chairmen gave reports, the gracious hospitality everywhere in evidence and the efficiency and precision with which all convention machinery was operated.

The great cordiality with which the Southern Auxiliary President was received and the many personal courtesies shown touched her heart and stamped her memory in a way that will bring a lifetime of joy and gratitude.

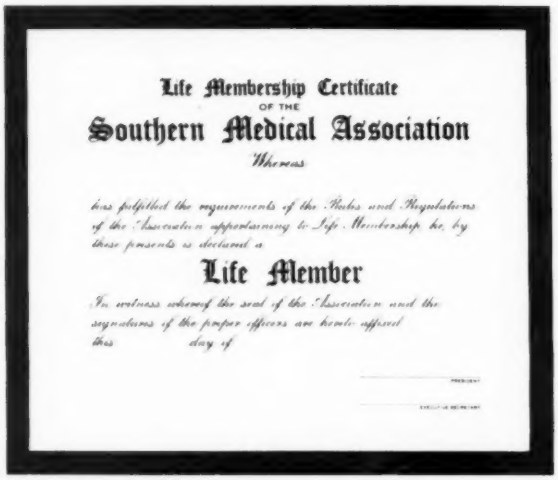
CONVENTIONS ATTENDED were: *Missouri,* St. Louis, Mrs. Armond D. Fries, President; *Maryland,* Baltimore, Mrs. David S. Clayman, President; *Alabama,* Montgomery, Mrs. William P. Noble, President; *Texas,* Houston, Mrs. Horace S. Renshaw, President; *Tennessee,* Gatlinburg, Mrs. Joseph D. Anderson, President; *Georgia,* Macon, Mrs. John L. Elliott, President; *Louisiana,* Shreveport, Mrs. Boni J. DeLaureal, President; *North Carolina,* Asheville, Mrs. Donnie M. Royal, President; *District of Columbia,* Washington, Mrs. James E. Wissler, President; *Florida,* Miami, Mrs. Perry D. Melvin, President; *Mississippi,* Jackson, Mrs. Arthur E. Brown, President; and *South Carolina,* Myrtle Beach, Mrs. B. J. Workman, Sr., President.

CONVENTIONS TO BE HELD IN THE FALL: *Kentucky,* Louisville, Mrs. Charles B. Stacy, President; *Virginia,* Richmond, Mrs. Lee S. Liggan, President; and *West Virginia,* White Sulphur Springs, Mrs. J. C. Huffman, President.

Because of conflicting meetings, much to her regret, the Southern Auxiliary President was unable to attend the Conventions of two outstanding Auxiliaries: *Arkansas,* Hot Springs, Mrs. Jack Kennedy, President and *Oklahoma,* Oklahoma City, Mrs. John Powers Wolff, President.

MRS. WALKER L. CURTIS, *President*
Woman's Auxiliary to the SMA

Life Membership Established



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Whereas
has fulfilled the requirements of the Rules and Regulations of the Association appertaining to Life Membership he, by these presents is declared a
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In witness whereof the seal of the Association and the signatures of the proper officers are hereto affixed this day of

We are pleased to announce a plan of Life Membership for the members of the Southern Medical Association. Illustrated above is the attractively engraved certificate which is sent to life members after it has been inscribed, the Association seal affixed and framed—ready for hanging.

The rules governing life membership are few and simple and the benefits are great. Life members will continue to enjoy all of the rights and privileges of active members and will receive the Southern Medical Journal and other publications of the Association for LIFE.

This "once for all" method of paying dues will prevent loss of membership through oversight, hardship or disability. Frequently, members lose our insurance protection through inadvertent lapse in membership.

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Simply fill out the application form which appears on page 883 and mail with your check to Southern Medical Association, 1020 Empire Building, Birmingham 3, Alabama. Your certificate, dated the day of expiration of your current dues, will be executed and mailed immediately!

V. O. F.

25 YEARS AGO

Actions and Uses of Dinitrophenol.*

"We have recently shown in a series of papers that alpha-dinitrophenol markedly augments metabolism in doses which are not demonstrably harmful. As this drug may have a number of important clinical applications, it seems desirable to present a summary report of its pharmacologic and therapeutic effects, and to point out certain potential dangers in, and limitations to, its use.

"During the World War, dinitrophenol was called to the attention of French physicians by cases of poisoning from it in munitions factories. Only incomplete investigations of the actions of the compound were made at that time, . . .

"When dinitrophenol is given to experimental animals, it causes an increase in metabolism within one minute after injection. . . . The increase in metabolism with doses of 10 mg. per kilogram or less is about 50 per cent. With higher doses, metabolism may be increased fourfold or more, until the animal produces heat so fast that it may be killed by the resulting fever. . . . The increase in metabolism is due to a direct stimulation of cellular metabolism and is not accompanied by an increase in muscular activity. This tremendous upswing of metabolism is not accompanied by important changes in the circulatory system unless asphyxia results from inadequate oxygenation of the blood. Then there may be acceleration of the pulse and rise of blood pressure. There is, however, a very marked increase in respiration, which may be a response to the increased oxygen need or to carbon dioxide production. . . .

"The actions of dinitrophenol in man agree closely with those in animals when equivalent doses are used.

"In eight patients, single doses of from 3 to 5 mg. per kilogram of body weight were given orally to determine the effect on the basal metabolic rate. This was increased from 20 to 30 per cent in the first hour and was maintained at this level for about twenty-four hours. Then it gradually began to fall, reaching normal on the third day. . . . Given orally or subcutaneously, these doses caused no changes in temperature, respiration or pulse rate even after two months of daily administration. Single doses between 5 and 10 mg. per kilogram caused no changes in temperature, pulse or respiration but did make the subjects sweat copiously. . . . The latter doses are considered too dangerous for routine use.

"All these subjects lost body weight without resort to dietary restrictions. The maximum total loss in any patient was 9 Kg. (20 pounds) in ten weeks. . . . These patients did not suffer from any deleterious symptoms as a result of their reducing treatment. On the contrary, they felt better and more active than before.

"Preliminary results indicate that dinitrophenol can satisfactorily increase metabolism for therapeutic purposes in patients. The limiting factor would seem to be the fever caused by the increased heat production. The metabolism has been maintained at a rate of 50 per cent above normal for months, with no deleterious symptoms, such as the hyperirritability caused by equivalent doses of thyroid gland. Therefore, dinitrophenol offers this advantage over thyroid. It would appear generally useful for increasing the metabolic rate, experimentally and therapeutically.

"Oral administration of the drug to obese patients in daily doses of about 3 mg. per kilogram has resulted in steady reduction of their weight, without demonstrable side-actions. Accordingly, extended trials in this clinical condition are justified. The pharmacologic evidence indicates a usefulness of the drug in hypothyroidism and other states of depressed metabolism.

"In view of extended clinical applications which the drug may receive, it is desirable to indicate possible dangers from and limitations to its use. First, continuous administrations in animals and patients have been made for periods not longer than three months, and none have been made in patients with serious disease. . . . excessive doses of dinitrophenol may cause a fatal hyperpyrexia. Finally, the possibility of an idiosyncrasy such as an unusual sensitivity or atypical response to the drug should be kept in mind, although we have not seen unusual reactions. In view of these things, we urge that, for the present, dinitrophenol be used only as an experimental therapeutic procedure in carefully selected patients under close observation by the physician."

(Editor's Note. A drug of great promise for reduction of weight was soon shown to have dangerous side effects.)

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Continued on page 941

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Southern Medical Association
New Orleans
November 3, 4, 5, and 6, 1958

Please Complete this Application and forward to New Orleans Address Now!

A Housing Bureau has been established for your convenience in making hotel reservations in New Orleans for the forthcoming meeting of the Southern Medical Association. Comparable room rates are listed. *Use the Reservation Blank below.* Please specify your first, second and third choice hotel. All requests for reservations should give: (1) anticipated date and hour of arrival; (2) date and approximate hour of departure; and (3) names and addresses of all persons who will occupy the accommodations. ALL RESERVATIONS SHOULD BE CLEARED THROUGH THE HOUSING BUREAU. Since all requests for rooms will be handled in chronological order, you should mail your application as early as possible. All reservations will be confirmed.

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Section on Gynecology

*Dr. W. Norman Thornton, Jr., *Chairman*, University Hospital, Charlottesville, Virginia

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*Dr. L. A. Pyle, *Secretary*, The Chesapeake & Potomac Telephone Companies, 722 12th Street, N.W., Washington 5, D. C.

Section on Medicine

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Dr. Ellard M. Yow, *Chairman-Elect*, Department of Internal Medicine, Baylor University College of Medicine, Houston 25, Texas

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*Dr. Kelly T. McKee, *Secretary*, Medical College Hospital, 55 Doughty Street, Charleston, South Carolina

Section on Neurology and Psychiatry

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*Dr. Theodore L. L. Soniat, *Chairman-Elect*, Ochsner Clinic, New Orleans 15, Louisiana

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*Dr. Mercer G. Lynch, *Secretary*, Ochsner Clinic, Prytania and Aline Streets, New Orleans, Louisiana

Section on Orthopedic and Traumatic Surgery

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Section on Pathology

Dr. W. A. D. Anderson, *Chairman*, Jackson Memorial Hospital, Miami 36, Florida

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Section on Physical Medicine and Rehabilitation

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*Dr. Torsten H. Lundstrom, *Secretary*, VAC Hospital, Mountain Home, Tennessee

Section on Proctology

*Dr. Mark M. Marks, *Chairman*, 316 Doctors Building, 701 E. 63rd Street, Kansas City 10, Missouri

*Dr. Patrick H. Hanley, *Vice-Chairman*, 3503 Prytania Street, New Orleans 15, Louisiana

Dr. Francis J. Burns, *Secretary*, 4660 Maryland Avenue, St. Louis 8, Missouri

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Section on Urology

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Exclusive Publication: Articles offered for publication must be contributed solely to the Southern Medical Journal.

Manuscripts: Manuscripts should be original copy, typewritten, double-spaced, with wide margins. Because of lack of space, it is necessary to limit the number of bibliographic references to twenty. Footnotes and references should conform to the following style:

1. Doe, J. E.: What You Should Know about It, New England J. Med. 243:435, 1950.

Illustrations: Black and white glossy prints, preferably 5 by 7 inches, and drawings in India ink on white paper are required. The author's name, number and indication of top, if doubtful, should be attached. Necessary plates not exceeding six, or one and a half pages, will be furnished by the Journal.

Reprints: Reprints are available at publisher's cost. An order form will accompany author's galley proof and should be returned with the galley to the Editor.

Book Reviews: Books and monographs submitted for review should be mailed to the Editor. Acknowledgment will appear in the Journal. Selection rights reserved.

Editorial Address: All manuscripts, corrected galley proof, reprint orders, books for review and related correspondence should be addressed to the Editor, R. H. Kampmeier, M.D., Vanderbilt University School of Medicine, Nashville 5, Tennessee.

Business Address: All correspondence related to membership, subscriptions, advertising, and other business should be addressed to the Southern Medical Association, Empire Building, Birmingham 3, Alabama.

SOUTHERN MEDICAL NEWS

ALABAMA

The publication of Dr. Tom Spies' article, "Some Recent Advances in Nutrition," in the June 7 issue of the Journal of the American Medical Association was not only a milestone in the science of nutrition, but also marked the first-time use of color illustrations in the scientific text of this Journal. Appearing in the same issue was an editorial commenting on the article by way of emphasis on the relation of nutrition to medical problems.

Dr. Edgar G. Givhan, Jr., Birmingham, has been elected President of the Alabama Medical Association; President-Elect, Dr. William R. Carter, Repton; Vice-President, Dr. William E. White, Anniston; State Board of Censors, Dr. Wilmot S. Littlejohn, Birmingham; Dr. Justus M. Barnes, Montgomery, and Dr. James O. Finney, Gadsden.

The following specialty groups have elected their officers:

Alabama Association of Obstetricians and Gynecologists, President, Dr. Julian P. Hardy, Birmingham; Vice-President, Dr. Theodore F. Middleton, Mobile; Secretary-Treasurer, Dr. H. Lyman Findley, Jr., Tuscaloosa.

Alabama Orthopaedic Society, President, Dr. John F. Comer, Birmingham; Vice-President, Dr. Alfred R. Earl, Mobile; Secretary-Treasurer, Dr. Paul D. Everest, Montgomery.

Alabama Chapter, American College of Chest Physicians, President, Dr. Arthur A. Calix, Decatur; Vice-President, Dr. Justus M. Barnes, Montgomery; Secretary-Treasurer, Dr. William J. Tally, Gadsden.

Alabama Pediatric Society, President, Dr. Jerome A. Weaver, Birmingham; President-Elect, Dr. Robert O. Harris III, Mobile; Secretary-Treasurer, Dr. Joseph M. Humphries, Birmingham.

Alabama Society of Anesthesiologists, President, Dr. Robert Nelson, Jr., Tuscaloosa; Secretary-Treasurer, Dr. Hal D. Broadhead, Montgomery.

Newly elected officers of the Society of Medical History are: President, Dr. E. B. Glenn; Vice-President, Dr. Victor Spira; Editor, Dr. Ben C. Moffett; Assistant Editor, Dr. John J. Sharry, all of Birmingham.

Dr. Polly Ayers is the new President of the Birmingham District Dental Society. Other officers include: Dr. Richard Westbrook, President-Elect; Dr. W. J. Kyle, Vice-President; Dr. William Stanley Reynolds, Secretary-Treasurer; Dr. V. Farnum, Board of Censors; and Dr. W. Rye, Executive Council.

A new addition to the Department of Microbiology at the University of Alabama Medical Center is Dr. Norman L. Lawrence as Assistant Professor of Microbiology.

Dr. Robert D. Francis, Birmingham, has been elected Vice-President of the Southeastern Section of the Society of American Bacteriologists.

ARKANSAS

Dr. Frank Rhodes has received the Distinguished Service Award by the Osceola Junior Chamber of Commerce and was named Osceola's Outstanding Young Man of 1957.

Dr. R. C. Dickinson, DeQueen, was appointed by Governor Faubus to the Board of Control of the State Hospital.

Dr. W. F. Shepherd is the new chief of staff at St. Bernard's Hospital in Jonesboro, and Dr. Edward Cooper has been re-elected secretary of staff.

New officers of the Jackson County Medical Society are: President, Dr. John Wright, Newport; Vice-President, Dr. R. O. Norris, Tuckerman; and Secretary-Treasurer, Dr. John D. Ashley, Newport.

The following officers were elected by the Mississippi County Medical Society: President, Dr. M. L. Godley, Manila; Vice-President, Dr. Julian Fairley, Osceola; and Secretary-Treasurer, Dr. Eldon Fairley, Osceola.

Dr. Fount Richardson, Fayetteville, has been elected President-Elect of the American Academy of General Practice.

DISTRICT OF COLUMBIA

Dr. Robert A. Cohen has been elected President of the Washington Psychiatric Society; Dr. Norman Taub, President-Elect; Dr. Marvin L. Adland, Secretary; and Dr. Morris Kleinerman, Treasurer.

New officers for the Washington Urological Society are: President-Elect, Dr. Michael A. Puzak and Dr. G. Roland Gable, Secretary-Treasurer.

The following officers have been elected by the Clinical Club of Washington; President, Dr. Robert R. Montgomery; Vice-President, Dr. Max J. Fischer; and Secretary-Treasurer, Dr. Vincent L. O'Donnell.

Dr. Hugh H. Hussey is the new Dean of Medicine at Georgetown University. He also has been appointed to the Board of Directors of the World Medical Association, United States Committee; and to the Board of Directors of the American Medical Education Foundation.

Dr. I. Phillips Frohman is the new General Editorial Consultant to the *Current Medical Digest*.

Dr. Edward D. Freis is now Associate Editor of the *Heart Bulletin* of the American Heart Association.

Dr. R. Frank Jones, Chief of the Urology Division, Howard University School of Medicine, was honored at the YMCA's 105th Anniversary dinner.

Dr. Stafford W. Hawken has been reappointed Chief of the Medical Staff of Columbia Hospital for Women and Dr. H. J. Russell McNitt as Deputy Chief of Staff.

Four members of the District Medical Society was honored by Georgetown University. Dr. Robert J. Coffey received a gold medal for full-time service and a silver medal was presented to Drs. Gerald H. McAteer, J. Lawn Thompson, and T. Frasier Williams.

Georgetown University School of Medicine has promoted Dr. Laurence A. Kyle from Associate to full Professor of Medicine.

The new Chairman of the Scientific Council of the Washington Heart Association is Dr. George E. Schreiner.

Dr. Bruce I. Shnider has been named Co-chairman of the Eastern Cooperative Cancer Chemo-Therapy Study Group.

Dr. John F. Nancarrow, Chevy Chase, is the newly appointed head of the Department of Hematology at the Washington Hospital Center.

Dr. William B. Walsh has been named to the Na-

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Books Received

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Medicine and German, Vanderbilt University, Nashville, Tenn. 194 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1957. Price $4.50.

Mosby's Review of Practical Nursing. By five contributing authors. Second edition, illustrated. 354 pages. St. Louis: The C. V. Mosby Co., 1957. Price $4.25.

Anatomies of Pain. By K. D. Keele, M.D., F.R.C.P., Ashford Hospital and Staines Hospital. 197 pages. Springfield, Illinois: Charles C. Thomas, Publisher, 1957. Price $5.50.

Juvenile Epilepsy: Report of a Study Group. World Health Organization: Technical Report Series No. 130. 44 pages. 1957. Price $.30.

Hypnography. By Ainslie Meares, MBBS., B.AGR.Sc., DPM. 265 pages. Springfield, Illinois: Charles C. Thomas, Publisher, 1957. Price $7.75.

Cardiovascular Collapse in the Operating Room. By Herbert E. Natof, M.D., Assistant in Anesthesia, University of Illinois; and Max S. Sadove, M.D., Professor of Surgery (Anesthesiology), University of Illinois College of Medicine, and Head, Department of Anesthesiology, Research and Educational Hospitals. 192 pages. Philadelphia: J. B. Lippincott Company, 1958. Price $6.00.

Tumors of the Soft Somatic Tissues. By George T. Pack, M.D., Associate Professor of Clinical Surgery, Cornell University; and Irving M. Ariel, M.D., Associate Clinical Professor of Surgery and Associate Attending Surgeon, New York Medical College. 652 illustrations, 796 pages. New York: Paul B. Hoeber, Inc., 1958. Price $30.00.

Pharmacology and Therapeutics. By Arthur Grollman, M.D., Professor and Chairman of Department of Experimental Medicine, The Southwestern Medical School. Third edition, revised, 192 illustrations, 2 in color. 966 pages. Philadelphia: Lea & Febiger, 1958. Price $12.50.

Year Book of Drug Therapy, 1957-1958. Edited by Harry Beckman, M.D., Director, Departments of Pharmacology, Marquette University Schools of Medicine and Dentistry. 490 pages. Chicago: The Year Book Publishers, 1957. Price $7.50.

Physical Methods in Physiology. By W. T. Catton, M. Sc., Physiology Department, King's College, Newcastle-upon-Tyne. 368 pages. New York: Philosophical Library, 1957. Price $10.00.

The Neuroses and Their Treatment. Edited by Edward Podolsky, M.D., Department of Psychiatry, Kings County Hospital, Brooklyn. 555 pages. New York: Philosophical Library, 1957. Price $10.00.

Pre-Employment Disability Evaluation. By William A. Kellogg, M.D., Clinical Professor of Surgery, New York Polyclinic Postgraduate Medical School. 155 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1957. Price $10.50.

Heart Disease—Cause, Prevention, and Recovery. By Philis S. Chen, Ph.D., Professor of Chemistry and Chairman of Division of Natural Sciences, Atlantic Union College. 186 pages, illustrated. South Lancaster, Massachusetts: The Chemical Elements, 1958. Price $5.00.

Reaching Delinquents Through Reading. By Melvin Roman, Ph.D., American Lecture Series No. 313. 125 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1958. Price $4.50.

A Handbook on Diseases of Children. By Bruce Williamson, M.D., (Edin.), F.R.C.P., (Lond.) Physician, Children's Dept., Royal Northern Hospital; Children's Hospital, Northaw; Prince of Wales General Hospital; Barnet General Hospital. 464 pages, Eighth Edition. Baltimore: Williams and Wilkins Company, 1957. Price $6.00.

Strabismus Ophthalmic Symposium II. Edited by James H. Allen, M.D., Professor and Chairman of the Department of Ophthalmology, The Tulane University School of Medicine, Louisiana. 251 illustrations, 541 pages. St. Louis: The C. V. Mosby Company, 1958. Price $16.00.

Chemistry of Lipides as Related to Atherosclerosis. A Symposium. Edited by Irvine H. Page, M.D., Cleveland Clinic Foundation, Cleveland, Ohio. 334 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1958. Price $8.50.

The Postoperative Chest. Radiographic Considerations After Thoracic Surgery. By Hiram T. Langston, M.D., Anton M. Pantone, M.D., and Myron Melamed, M.D., University of Illinois College of Medicine. 223 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1958. Price $8.00.

Brain Tumors. Their Biology and Pathology. By K. J. Zulch, M.D., Professor of Neurology, University of Cologne, and Head, Department of General Neurology, Max Planck Institute for Brain Research. Translated by Alan B. Rothballer, M.D., and Jerzy Olszewski, M.D. 303 pages. New York: Springer Publishing Company, Inc., 1957. Price $9.50.

The Human Ear Canal. By Eldon T. Perry, M.D., Instructor in Dermatology, Wayne University. American Series No. 322. 107 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1957. Price $4.75.

Cortisone Therapy. By J. H. Glyn, M.A. (Cantab.), M.D., M.R.C.P., D. Phys. Med., Consultant in Physical Medicine to the Prince of Wales and Tottenham Group of Hospitals. 155 pages. New York: Philosophical Library, Inc., 1957. Price $10.00.

Non-Group Enrollment for Health Insurance. By Sol Levine, Ph.D., Odin W. Anderson, Ph.D., and Gerald Gordon, Health Information Foundation. 171 pages. Cambridge, Mass.: Harvard University Press, 1957. Price $5.00.

Practical Clinical Chemistry. By Alma Hiller, Ph.D., Associate Professor of Biological Chemistry, University of Illinois College of Medicine. Second edition, 265 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1957. Price $6.50.

Marriage and Personality. By Ainslie Meares, Melbourne, Australia. 157 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1957. Price $3.95.

The Planning of International Meetings. A Handbook Issued by the Council for International Organizations of Medical Sciences established under the joint auspices of UNESCO and WHO. Oxford, Blackwell Scientific Publications. Springfield, Ill.: Charles C. Thomas, Publisher, 1958. Price $2.50.

Adventures in Medical Education. By G. Canby Robinson, M.D. 338 pages. Cambridge, Mass.: Published for the Commonwealth Fund by Harvard University Press, 1957. Price $5.00.

Clinical and Immunologic Aspects of Fungous Diseases. By J. Walter Wilson, M.D., Clinical Professor of Medicine, Dermatology, University of Southern California. American Lecture Series No. 324. 270 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1957. Price $6.75.

Aids to Bacteriology. By H. W. Scott-Wilson, B.Sc., B.M., B.Ch. (Oxon) Director of the Laboratories of Pathology and Public Health, London. Ninth edition, 385 pages. London: Bailliere, Tindall and Cox, 1957. Price $3.50.

Aids to Ophthalmology. By P. McG. Moffatt, M.D. (Lond.), M.R.C.P., F.R.C.S. (Eng.), D.O.M.S., Consultant Ophthalmic Surgeon and Lecturer, Moorfields Eye Hospital, Hammersmith, West London and St. Mark's Hospital Groups. Eleventh edition, 274 pages. London: Bailliere, Tindall and Cox, 1957. Price $3.00.

Diabetes as a Way of Life. By T. S. Danowski, M.D., Renziehausen Professor of Research Medicine, University of Pittsburgh School of Medicine. 167 pages. New York: Coward-McCann, Inc., 1957. Price $3.50.

BOOK REVIEWS

New Bases of Electrocardiography

By Demetrio Sodi-Pallares, Professor of Cardiovascular Clinics at the National University of Mexico, with Royall M. Calder, M.D., Editor, English Translation, Clinical Professor of Medicine, Graduate School, Baylor University. 720 pages with 520 illustrations. St. Louis: The C. V. Mosby Company, 1956. Price $18.50.

This book is the first English edition incorporating the work of Dr. Sodi-Pallares. Dr. Sodi-Pallares and his group at the National Institute of Cardiology in Mexico City have done excellent research for many years in basic mechanisms involved in electrocardiography. This book has given him an opportunity to gather together the various problems on which research has been done at the Heart Institute and to tie it in with the work of others. Certainly, as one reads this book, it is amazing to find the magnitude of work that has been done by Dr. Sodi-Pallares and his group.

This is not a textbook in the usual sense of the word. Dr. Sodi-Pallares has included chapters on principles of electricity, electrophysiology, and the electrical axis of the heart. With these as a beginning he goes into a discussion of the derivation of the electrocardiogram from both the unipolar limb leads and the precordial leads. There is an excellent chapter on the activation processes of the various components of the heart. Much of the work of Dr. Sodi-Pallares has been in this particular field and it has been condensed in this particular section. There are excellent illustrations on the activation processes of each region and of each component of the heart.

There is a concise discussion of the various methods of vectorcardiography and spatial vectorcardiography. The ventricular gradient is discussed in greater detail than in most books on electrocardiography. In addition, a chapter is devoted to the derivation of the electrocardiogram from an intracavitary point of view. In this chapter there are included electrocardiograms in both animals and humans with complete and incomplete bundle branch blocks, ventricular hypertrophy, subendocardial injury, and myocardial infarction.

This work of Dr. Sodi-Pallares is certainly monumental. It is not a textbook of electrocardiography for either the beginner or the relatively inexperienced. However, it is valuable reference for all physicians who are interested in electrocardiography and for all workers in the various fields of electrocardiographic research.

Lens Materials in the Prevention of Eye Injuries

By Arthur Hail Keeney, M.D., University of Louisville School of Medicine. American Lecture Series. 61 pages. Springfield, Ill.: Charles C. Thomas, Publisher, 1957. Price $3.50.

This work was written for the purpose of analyzing the technical development of safety lens materials useful in spectacles and goggles to prevent mechanical injury; to study experimentally the characteristics and safety lens material and to formulate specific indications and contraindications for the various materials. The use of break resistant substances is becoming increasingly widespread in children's lenses as well as in adults whose vocations or avocations are at all hazardous. This monograph is recommended for physicians engaged in industrial medicine or who are refractionists.

Urologic Injuries in Gynecology

By Henry C. Falk, M.D., Clinical Professor of Gynecology and Obstetrics, New York University Graduate School. 248 pages. Philadelphia: F. A. Davis Company, 1957. Price $7.50.

This easily read and entertaining monograph by Dr. Falk covers very adequately a subject of profound and constant interest to all those who do any gynecologic surgery. He includes in this treatise the medical history, diagnosis, and definitive treatment for the surgical injuries to the urinary tract encountered in pelvic surgery. The text is well written, the diagrams are clear and concise, leaving no doubt in the surgeon's mind as to the condition and correction thereof. His coverage of the subject certainly reveals his wide experience as a gynecologist and his practical familiarity with the conditions under study. This book is certainly to be recommended to everyone involved in pelvic surgery and should be required reading for every resident in gynecology.

Plaster of Paris Technique

By Marian English, S.R.N., R.F.N. 122 pages. Baltimore: The Williams and Wilkins Co., 1957. Price $4.00.

There are several books written on plaster of paris technic, most of them superfluous. This author who makes her own plaster from loose plaster powder and bandage, is somewhat "old fashioned." It is doubtful that the plaster she makes can approach the consistency and uniformity of modern-day machine prepared plaster. The only possible field of usefulness for this book would be that of medical students and certain it is that one practical demonstration of plaster technic would be more valuable than the time necessary to read the text of this book.

One Surgeon's Practice

By Frederick Christopher, M.D., Emeritus Professor of Surgery, Northwestern University Medical School. 145 pages. Philadelphia: W. B. Saunders Co., 1957. Price $4.00.

Dr. Frederick Christopher, now retired from the active practice of surgery, has written an excellent book of particular value to a resident surgeon prior to the launching of his career in the private practice of surgery. It is doubtful that the book will be of any value to the undergraduate student considering the practice of medicine and its value in assisting a medical student selecting his field of specialization is likewise questionable. However, this does not detract from the

usefulness of this volume. The author stresses the absolute necessity of upholding the ideals of medical practice as he himself has practiced these ideals. There is advice designed to assist one in selecting a location for practice, in setting fees, and even consideration given to nonprofessional activities. All in all this is a concise, readable, and useful book.

Gestation. Transactions of Third Conference, March, 1956

Edited by Claude A. Villee, Ph.D., Associate Professor of Biological Chemistry, Harvard Medical School. 240 pages. New York: Josiah Macy, Jr. Foundation, 1957. Price $4.75.

As the name of the book implies, its contents are concerned almost entirely with experimental studies and findings and work being done on the hormones and hormonal influence during gestation.

Most of the material presented and discussed is based on the results of animal studies. Factual material is also included in the discussions. Maternal and fetal endocrines, their function, interrelationships and effects brought about by their absence during growth and development are discussed. The placental hormonal influence is also included in the topics.

The means of presenting the material is in a discussion manner, and a question-answer technic is also employed. The participants are made of outstanding men in their own fields, both from basic science and clinical departments, thereby giving both academic and clinical aspects of the problem.

Prevention of Chronic Illness

Volume 1 of Chronic Illness in the U. S., Commission on Chronic Illness. 323 pages. Cambridge, Massachusetts: Published for the Commonwealth Fund by Harvard University Press, 1957. Price $6.00.

Contrary to what its name might suggest, the Commission on Chronic Illness is not an official governmental health agency; it is a private organization incorporated in 1949 for the specific purposes of modifying the public attitude that chronic illness is hopeless, to define the problems arising from chronic illness among all age groups, to coordinate separate programs for specific diseases with a general program to meet more effectively the needs of the chronically ill, to clarify the interrelationship of professional groups and agencies now working in the field, and to stimulate in every state and locality a well-rounded plan for prevention and control of chronic disease and for the care and rehabilitation of the chronically ill.

The Commission has set itself a monumental and mammoth task and if it does nothing more than promote a little better cooperation between some of the "prima donnas" of voluntary health agencies it will have succeeded. To get these various agencies to pool their efforts or at least to admit that theirs is not the only one or most important health agency in the community, would be a most gratifying improvement over the present situation which witnesses some of them battling each other for funds and refusing to join cooperative community fund raising campaigns because they cannot get as much that way. It is encouraging that many of the most influential health groups in the country are supporting the Commission.

This, the first of two volumes, is concerned with the prevention of the major causes of chronic illness. The Commission has adopted definitions to distinguish between two major types of prevention, primary, meaning prevention of the occurrence of disease, and secondary, meaning the halting of progression of disease. These concepts plus that of health promotion which aims to maintain health rather than prevent disease, are applied to the major causes of chronic illness in the United States today. These include largely controllable chronic diseases, such as syphilis and diabetes mellitus, partially controllable diseases such as rheumatic fever and bacterial endocarditis and largely uncontrolled diseases such as arteriosclerosis and hypertension.

This book is a welcome and refreshing addition to the ever increasing movement of preventive medicine.

Surgery for General Practice

By Victor Richards, M.D., Professor of Surgery, and Chairman of Department, Stanford University School of Medicine. 933 pages, 476 illustrations. St. Louis: The C. V. Mosby Company, 1956. Price $17.50.

This volume is a satisfactory condensation of much of the knowledge that is expected in the surgical portion of general practice. It has achieved, with some satisfaction, the necessary aim of giving general information without going into too much detail in limited fields of interest. There is an excellent chapter on orthopedic problems and fractures, in particular, which has the unusual quality of showing both good and poor results. There is no intention for this study to serve as a manual of technic, but it does give some idea of the general method of treatment.

Because it is impossible to cover the entire field of surgery in such a limited space, this volume goes somewhat deeper into the simple technics but does discuss in a survey fashion the more difficult procedures and their hazards. All in all it is an excellent survey book for the general practitioner and is a source for excellent advice and study. It has no particular value to the trained surgeon or to the student in training.

Chemosurgery in Cancer, Gangrene and Infections

By Frederic E. Mohs, M.D., Associate Professor of Chemosurgery, Department of Surgery, University of Wisconsin Medical School. 295 pages, illustrated. Springfield, Illinois: Charles C. Thomas, Publisher, 1956. Price $13.50.

This new and interesting field of chemosurgery has never been so adequately portrayed as in this volume. Dr. Mohs has advocated for some time the use of fixatives as an agent for the removal of tissue. In this volume he describes in some detail the use of zinc chloride as such a fixative. This agent is applied preferably in a paste. The result of the application of this paste is tissue fixation *in situ* and excision for microscopic examination.

There are chapters describing the role of this technic in various areas. These areas are usually superficial and readily accessible with the exception of the parotid gland. There are many excellent illustrations and some rather startling results are graphically depicted. There are, in addition, some chapters on establishing a chem-

otherapy clinic and establishing the specialty of chemosurgery.

For any one who may be interested in chemosurgery this is an excellent volume. It should be pointed out that this method has the disadvantages of any technic involving the cautery as far as the healing and disability is concerned. There is the single redeeming feature that the tissue can be examined microscopically after removal, and there are certain obvious limitations to such examination which may give a feeling of false security. On the whole this book is not of widespread interest and cannot be accepted as a manual of treatment by the individual without other training in this field.

Skin Surgery

By Ervin Epstein, M.D., Assistant Clinical Professor of Medicine (Dermatology), Stanford University Medical School. 223 pages, 242 illustrations. Philadelphia: Lea and Febiger, 1956. Price $7.50.

This is a book written for the practicing dermatologist. It will be of interest however to the plastic surgeon, general surgeon, oral surgeon and general practitioner. The primary purpose is to demonstrate various technics of surgical therapy for the dermatologist. The book is well edited and well illustrated. The only objection might be that some portions of the book are beyond the training and ability of most dermatologists and indeed of many general surgeons. These sections deal with plastic and oral surgical procedures which are too complicated except for men with specialized training in these fields. The chapters on electrosurgical technics and minor scapel surgery are particularly apropos and well written. The book is to be recommended with these qualifications.

Modern Office Gynecology

By George Blinick, M.D., Assistant Clinical Professor of Obstetrics and Gynecology, New York University College of Medicine; and Sherwin A. Kaufman, M.D., Associate Attending in Obstetrics and Gynecology, Beth Israel Hospital, New York City. 206 pages, 47 illustrations. Philadelphia: Lea & Febiger, 1957. Price $4.50.

The authors have chosen to divide this book into three sections: Common Gynecological Symptoms, Illustrations, and Annotated Bibliography.

The first section is unusually interesting reading considering it is carefully outlined for easy reference.

The second section gives clear illustrations of most of the current office technics. It would seem that these illustrations would be of more value had they been incorporated into the text of the first section.

The annotated bibliography or third section is a good selection from the literature. The annotations are to be commended and help lead the student to further information that he might desire in the literature.

Except for the organization, this work leaves no room for adverse writing. The presentation of diagnosis and therapy in Section I follows the line of general acceptability in modern gynecology. The bibliography is unusually complete and up to date. The authors may be proud of this addition to the doctors' office library.

Biochemical Disorders in Human Disease

Edited by R. H. S. Thompson, M.A., D.M., Professor of Chemical Pathology, Guy's Hospital Medical School; and E. J. King, Ph.D., D.Sc., F.R.I.C., Professor of Chemical Pathology, Postgraduate Medical School, both of the University of London. 783 pages, with 121 illustrations. New York: Academic Press, Inc., 1957. Price $12.60.

This edited volume contains twenty chapters which group diseases on an organ basis, a nutrient basis, or some peculiarity of metabolism. The chapters discuss diseases of the gastrointestinal tract, liver and biliary tract, blood, kidney and genitourinary tract, adrenal, bone and parathyroid glands, nervous system, muscle, connective tissue and reproductive organs, the anemias, hypertension, iodine metabolism, diabetes, malnutrition, disorders of amino acid and hemoglobin metabolism, porphyrias, hemochromatosis, glycogen storage diseases and galactosemia and lipidosis. Chapters are contributed by 31 authorities, 19 of whom are English.

Clearly the treatment of the subject varies considerably from chapter to chapter. The book is not a biochemistry text, but is more a discussion of biochemical physiology. Indeed, in certain of the sections the reader may wish for a more profound discussion of biochemistry. On the other hand it is written at a level that the modern clinician will find it informative and useful. Medical students no doubt likewise will profit from the book, particularly as a reference during their clinical years of medicine. There is sufficient clinical discussion that the biochemist also will benefit from reading the text.

The predominantly English authorship results in some chapters being especially oriented toward the British literature, an orientation which should prove useful to American readers who ofttimes become somewhat provincial in their reading habits. On the other hand, some sections would have been more balanced had they taken greater cognizance of some of the American background publications.

The choice of authorities to prepare the various chapters was wisely and critically made. This book deserves a wide reading by physicians, clinicians, pathologists, biochemists, physiologists, and medical students.

Dermatologic Formulary

By Frances Pascher, M.D., Editor. Revised 1957, 146 pages. New York: Paul B. Hoeber, Inc., 1957. Price $4.00.

This is a second edition of the formulary of the Skin and Cancer unit of the New York University Hospital and Medical School. It is short, with actually 146 pages of various topical and internal remedies. It combines the new and the old quite effectively and in each instance gives the formula, actions and uses, indications, side effects and directions for use. If the user of the formulary is well enough versed in dermatological diagnosis, this formulary will be of considerable value and can be recommended for any physician or medical student as a short guide to therapy.

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1. Arner, O., and Others: Nord. med. *58*:1346 (Sept. 12) 1957.
2. Wilner, S.: Canad. M. A. J. *77*:199 (Aug. 1) 1957.
3. Bruner, J. M. R.: U. S. Armed Forces M. J. *6*:489 (April) 1955.
4. Diamant, A. H.: Nord. med. *48*:1324 (Sept. 26) 1952.
5. Wendt, G. R., and Cameron, J. S.: Personal communication, Jan. 4, 1955.
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SEARLE

Continued from page 941

tional Advisory Committee on the Selection of Physicians, Dentists, and Allied Specialists.

FLORIDA

New officers for the Florida Radiological Society are: President, Dr. C. Robert DeArmas; Vice-President, Dr. John P. Ferrell; Secretary-Treasurer, Dr. Russell D. D. Hoover; Councilor to American College of Radiology, Dr. J. Maxey Dell, Jr.; Alternate Councilor, Dr. Oliver P. Winslow.

Dr. Sherman B. Forbes, Tampa, has been appointed Florida State Chairman of the Professional Advisory Committee to the National Society for the Prevention of Blindness.

Dr. Harold D. Van Schaick, Miami Beach, has been named chairman of the 1958 Florida Cancer Crusade.

Dr. Sidney Davidson, Lake Worth, has been reappointed Governor for the State of Florida of the American Diabetes Association.

Recently installed officers of the Hillsborough County Academy of General Practice are: Dr. James B. Hodge, Jr., Tampa, President; Dr. Collin F. Baker, Jr., Vice-President; and Dr. Robert H. Owrey, Secretary-Treasurer. New members of the Board of Directors are: Drs. Samuel H. Adams and Lester L. Zipser.

The Lions Club has honored Dr. George W. Karelas, Newberry, "for his unselfish service to the community and his devotion to duty" and his work as Chairman of the Committee on Rural Health of the American Academy of General Practice.

New officers for the General Hospital of Greater Miami are: President, Dr. David Kirsh; Vice-President, Dr. Irwin S. Morse; and Secretary, Dr. Bernard K. Guerin.

Dr. Chauncey M. Stone, Jr., has been made a Fellow in the American College of Physicians.

GEORGIA

Dr. George E. Wakerlin has been appointed Medical Director of the American Heart Association.

Newly elected Georgia Diplomates of the American Board of Orthopaedic Surgery include: Dr. Charles Freeman, Dr. Robert Wells, Dr. George Whatley, and Dr. Lovick E. Dickey.

Dr. B. T. Beasley was elected President of the Southeastern Surgical Congress for 1960.

New officers for the Atlanta Radiological Society are: President, Dr. Richard A. Elmer; Vice-President, Dr. J. Frank Walker; and Secretary-Treasurer, Dr. J. L. Clements, Jr.

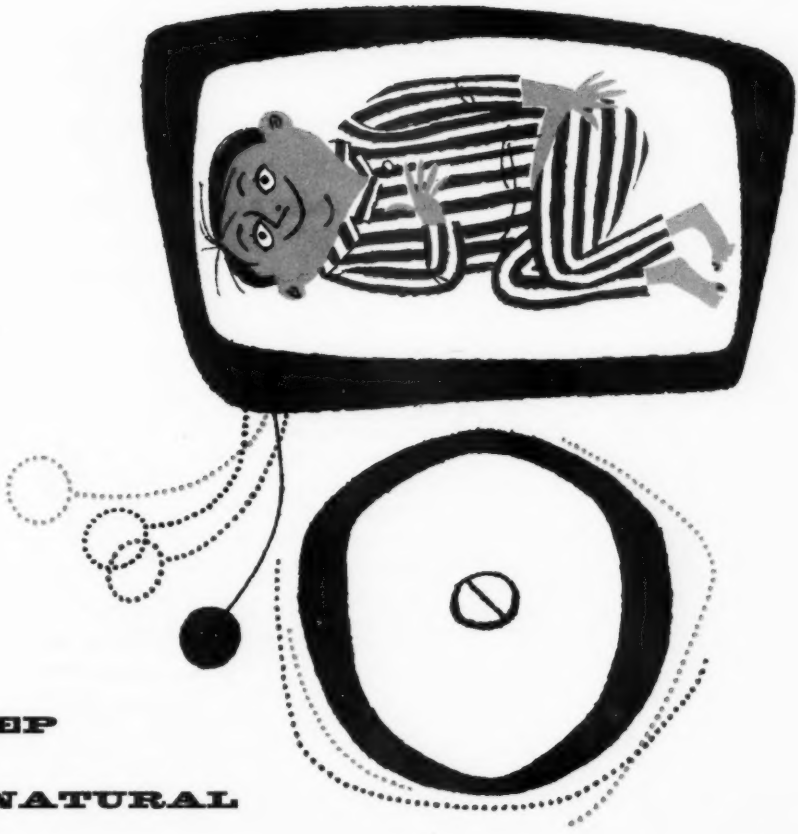
Dr. John R. Lewis, Jr., has won the Young Poets Award for 1957 given by *The Lyric Magazine*.

Dr. Judson L. Hawk, Sr., was honored at an appreciation dinner for "his outstanding service to the College of Pharmacy and the pharmaceutical profession and industry."

Dr. Joe Bosworth has been made a Brigadier General in the Army Reserves.

Dr. Brit B. Gay, Jr., and Dr. J. Frank Walker have recently been appointed Radiology members to the

Continued on page 60



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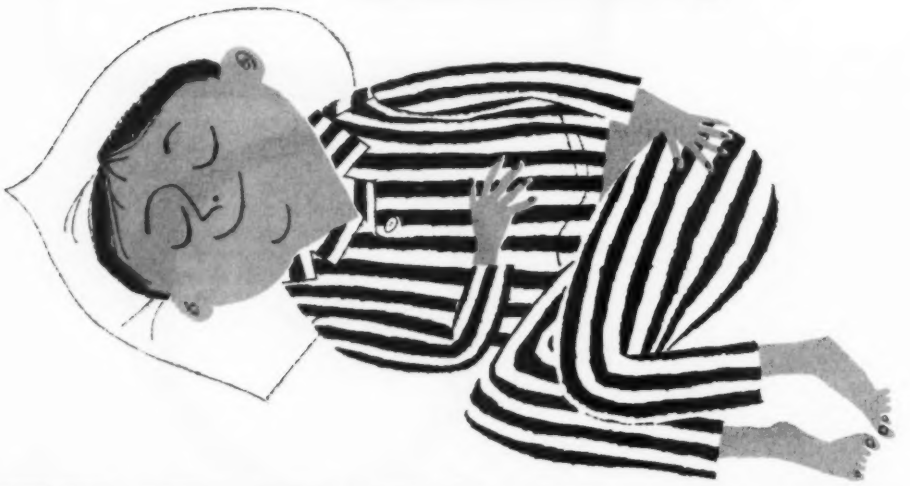

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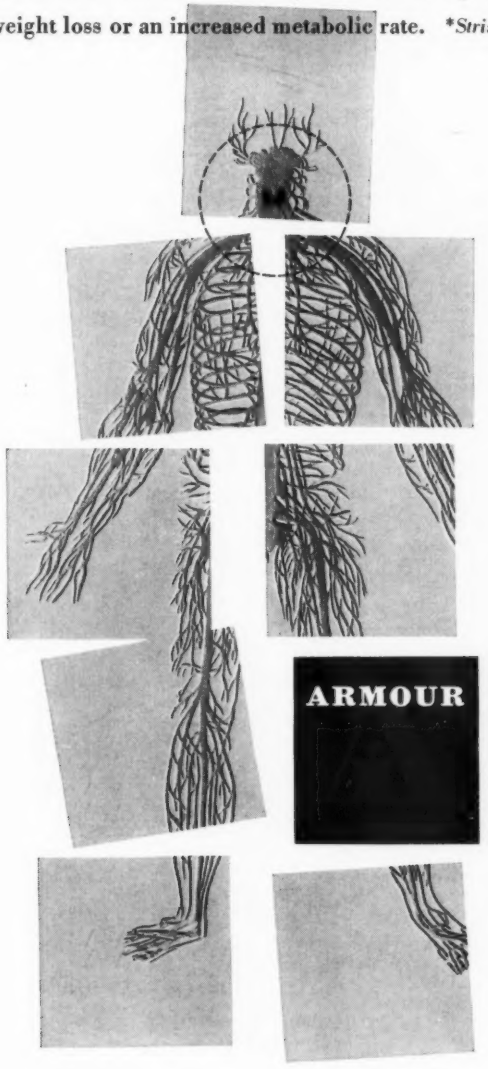

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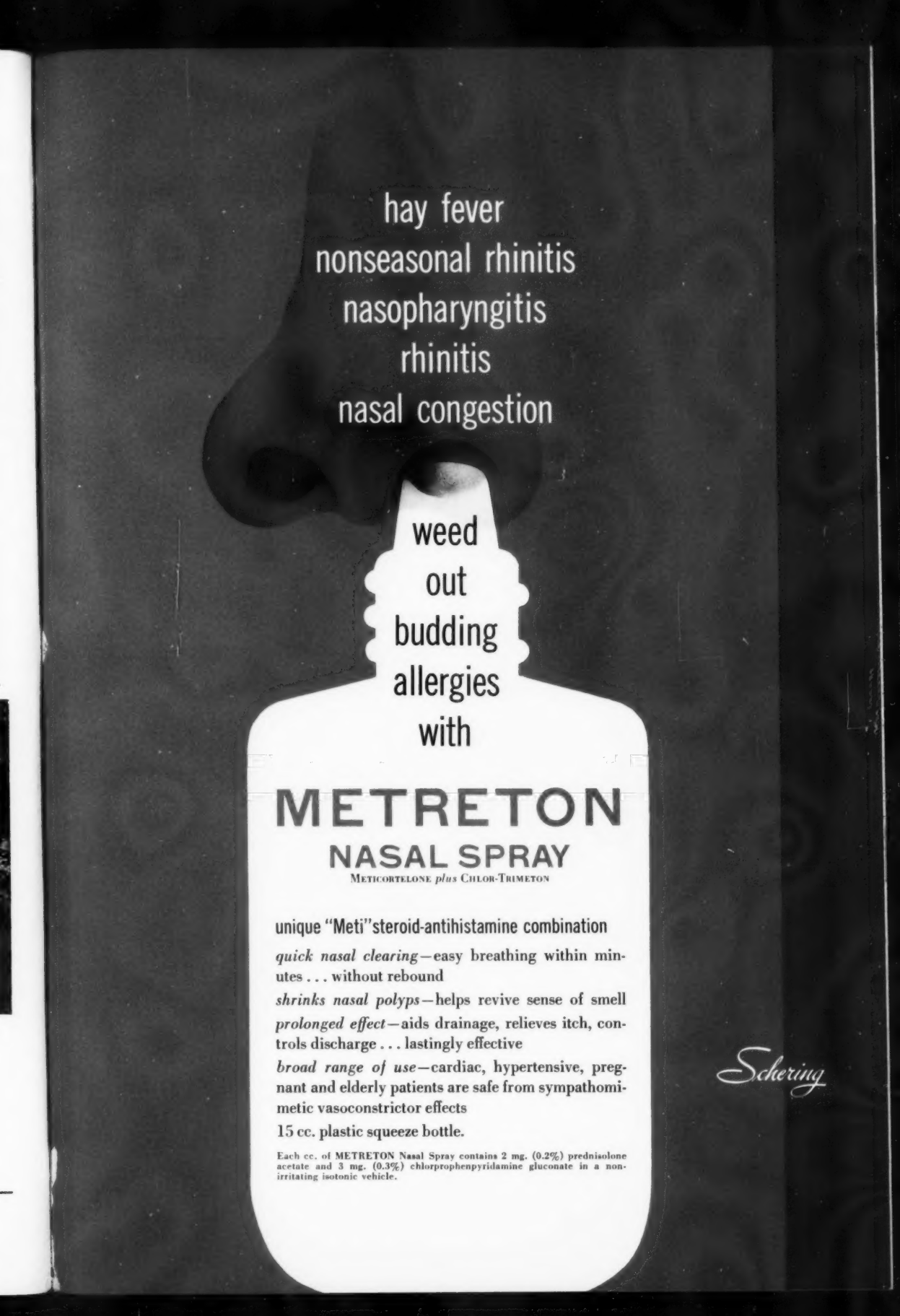
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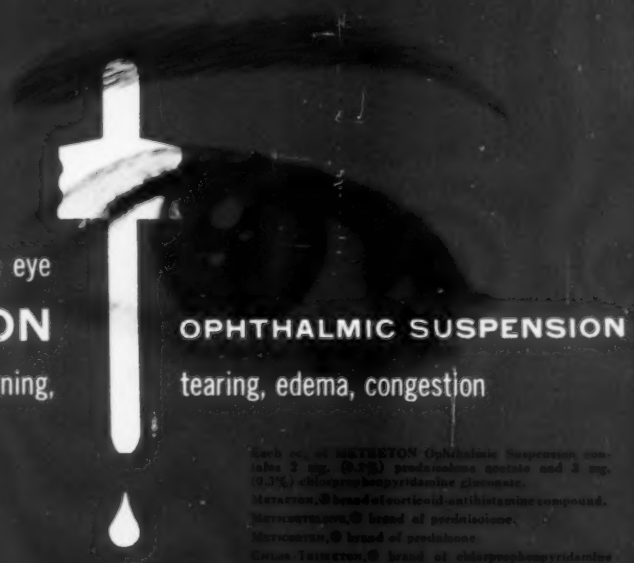

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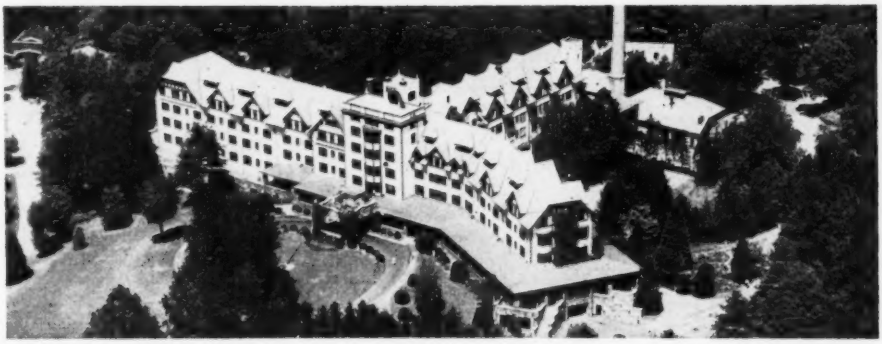

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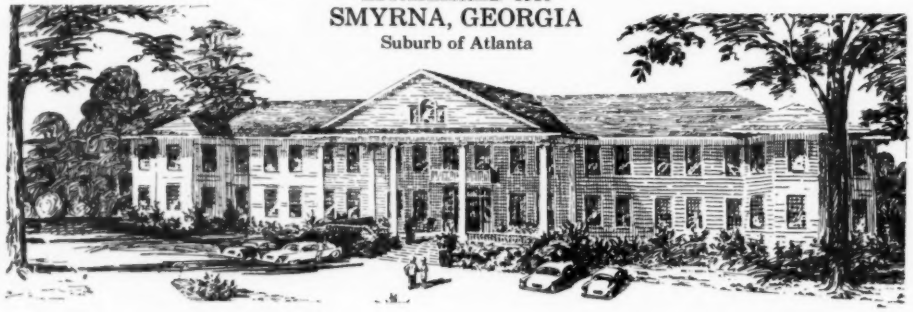

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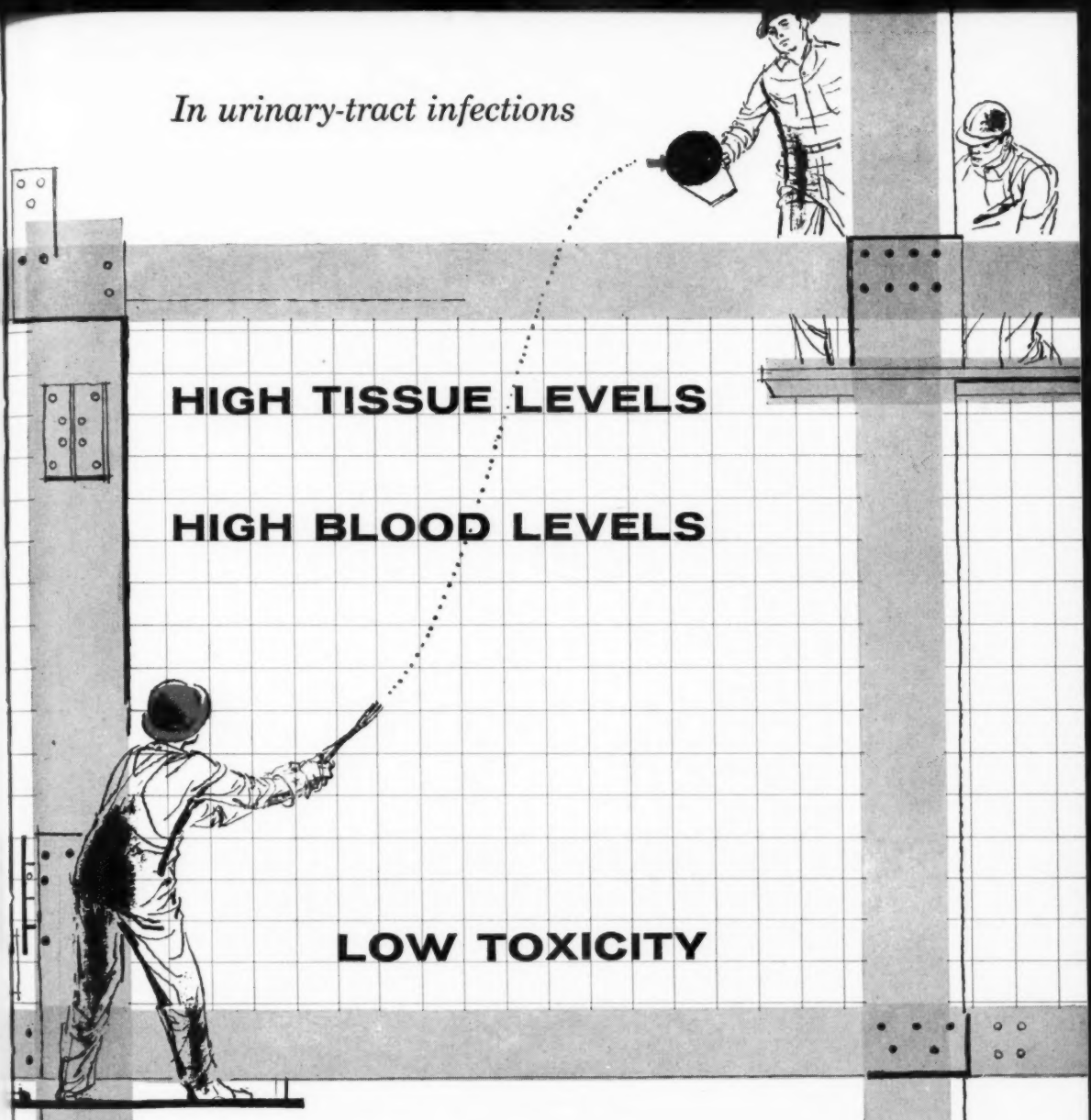

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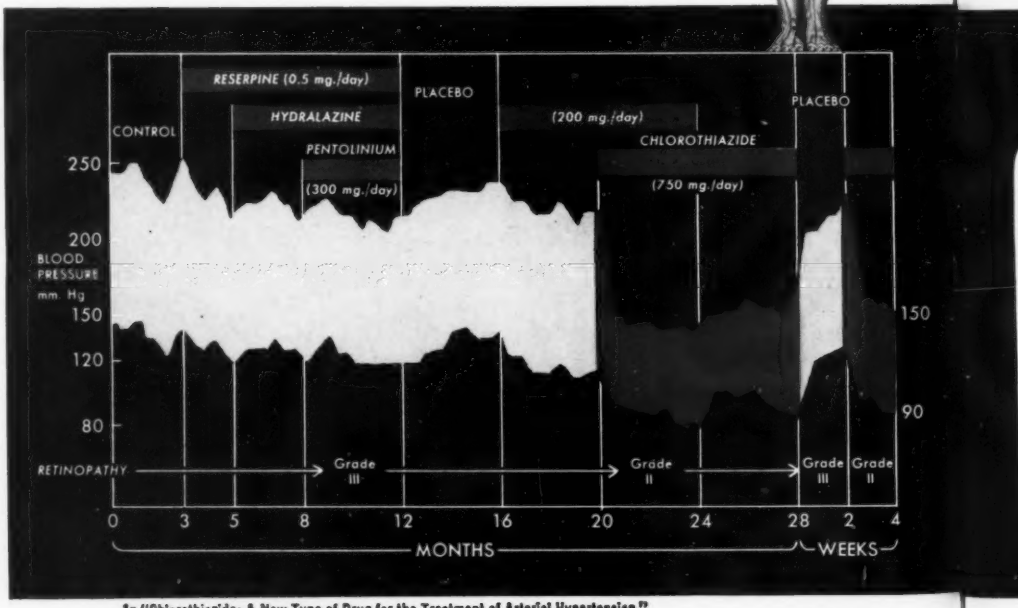
Freis, E. D., Wanko, A., Wilson, I. H. and Parrish, A. E.: J.A.M.A. **166**:137, Jan. 11, 1958.

"Chlorothiazide (maintenance dose, 0.5 Gm. twice daily) added to the regimen of 73 ambulatory hypertensive patients who were receiving other antihypertensive drugs as well caused an additional reduction [16%] of blood pressure." "The advantages of chlorothiazide were (1) significant antihypertensive effect in a high percentage of patients, particularly when combined with other agents, (2) absence of significant side effects or toxicity in the dosages used, (3) absence of tolerance (at least thus far), and (4) effectiveness with simple 'rule of thumb' oral dosage schedules."



In "Chlorothiazide: A New Type of Drug for the Treatment of Arterial Hypertension," Hollander, W. and Wilkins, R. W.: Boston Med. Quart. 8: 1, September, 1957.

MERCK SHARP & DOHME Division of MERCK & CO., Inc., Philadelphia 1, Pa. MSD

the effectiveness of 'DIURIL' (CHLOROTHIAZIDE) in Hypertension

as simple as 1-2-3

1 **INITIATE THERAPY WITH 'DIURIL'.** 'DIURIL' is given in a dosage range of from 250 mg. twice a day to 500 mg. three times a day.

2 **ADJUST DOSAGE OF OTHER AGENTS.** The dosage of other antihypertensive medication (reserpine, veratrum, hydralazine, etc.) is adjusted as indicated by patient response. If the patient is established on a ganglionic blocking agent (e.g., 'INVERSINE') this should be continued, but the total daily dose should be immediately reduced by as much as 25 to 50 per cent. This will reduce the serious side effects often observed with ganglionic blockade.

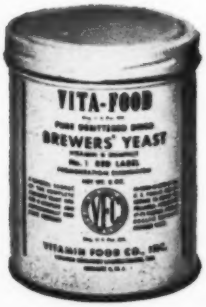
3 **ADJUST DOSAGE OF ALL MEDICATION.** The patient must be frequently observed and careful adjustment of all agents should be made to determine optimal maintenance dosage.

SUPPLIED: 250 mg. and 500 mg. scored tablets 'DIURIL' (chlorothiazide); bottles of 100 and 1,000.

'DIURIL' is a trade-mark of Merck & Co., Inc.

Smooth, more trouble-free management of hypertension with 'DIURIL'

A FRANK STATEMENT . . . ABOUT *VITA-FOOD*



The benefits of brewers' yeast are not subject to dispute. Its use both in human and animal nutrition is a matter of record. It is generally recognized as the richest natural source of the *entire* vitamin B complex, of nutritionally *complete* protein and *naturally* occurring minerals.

But before you prescribe, bear in mind that all yeasts are *not* brewers' yeast, nor do all brewers' yeasts measure up to the higher *quality* and balanced *potency* of VITA-FOOD. It differs not only in its superior culture media but also in the skill and know how involved in its production.

The essential value of VITA-FOOD has been proved for more than a quarter of a century of continuous use by physicians, hospitals, health departments and research laboratories. Its use for protection and relief of pellagra is only one of its greater achievements.

COMPARE THIS VITAMIN B ASSAY

Per Ounce (Two heaping tablespoonfuls)

Thiamin	4.2 mg.
Riboflavin	1.4 mg.
Niacin	11.3 mg.
Pantothenic Acid	3.4 mg.
Choline	119.0 mg.
Inositol	113.4 mg.
Pyridoxine	800 mcg.
Folic Acid	110 mcg.
Biotin	30 mcg.
Para-Amino-Benzoic Acid	280 mcg.

Plus independent vitamin B growth, lactation and other vitamin B factors natural to genuine Brewers' Yeast

VITAMIN FOOD CO., INC.

187 SYLVAN AVE.

NEWARK 4, NEW JERSEY

Continued from page 50

Medical Advisory Board of the Atlanta Tuberculosis Association.

Dr. Jack C. Norris was recently appointed a member of the Atlanta City Executive Committee, representing the Fifth Ward.

Dr. Robert L. Robinson, Atlanta, has been inducted as a junior member of the International College of Surgeons.

Dr. Charles E. Todd has been certified by the American Board of Surgery. Others receiving certifications are: Dr. William H. Bennett and Dr. William M. Morrison by the American Board of Urology; and Dr. James A. Kaufmann by the American Board of Internal Medicine, all of Atlanta.

New appointments at Grady Memorial Hospital are: Dr. Bernard L. Hallman, Director of Professional Services; and Dr. Charles A. LeMaistre, Coordinator of Clinics.

Dr. Philip R. Edwards, Chamblee, has been elected Vice-President of the Society of American Bacteriologists.

KENTUCKY

Dr. James W. Archer, Paintsville, has been elected Chairman of the 1958-59 KSMA Nominating Committee.

Dr. H. Hart Hagan, Louisville, was elected President of the Kentucky Surgical Society, and Dr. Ballard

Continued on page 63

CITY VIEW SANITARIUM

For the diagnosis and treatment of nervous and mental disorders, and addiction to alcohol and drugs.

Established 1907

NASHVILLE, TENNESSEE

Three steps are necessary—

in establishing correct eating patterns

supervision by the physician[1,2,3]
a balanced eating plan[1,2,3]
selective medication[1,2,3]

Obedrin®

and the 60-10-70 Basic Plan

Following the establishment of desired eating patterns—the maintenance of the acquired habits is most important. Here, Obedrin and the 60-10-70 Plan can be valuable aids to both the physician and patient.

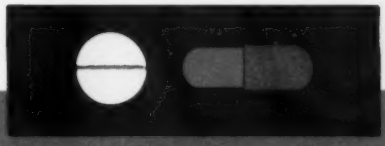
Obedrin provides:

- Methamphetamine for its proven anorexigenic and mood-lifting effects.
- Pentobarbital as a balancing agent, to guard against excitation.
- Vitamins B_1 and B_2 plus niacin to supplement the diet.
- Ascorbic acid to aid in the mobilization of tissue fluids.

1. *Eisfelder, H.W.: Am. Pract. & Dig. Treat. 5:778 (Oct. 1954)*
2. *Freed, S.C.: G.P. 7:63 (1953)*
3. *Sherman, R.J.: Medical Times, 82:107 (Feb. 1954)*

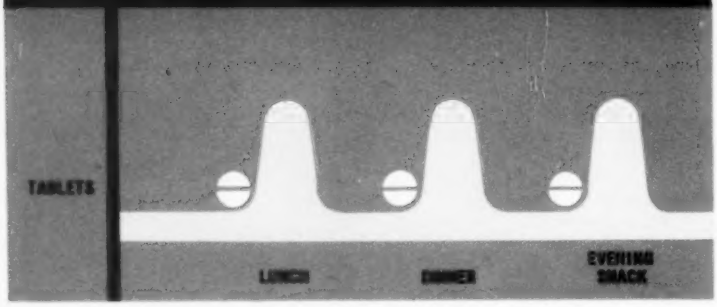
Formula: Tablets and Capsules

Semoxydrine® HCl (Methamphetamine HCl)	5 mg.
Pentobarbital	20 mg.
Ascorbic Acid	100 mg.
Thiamine Mononitrate	0.5 mg.
Riboflavin	1 mg.
Nicotinic Acid	5 mg.



Bristol, Tennessee • New York • Kansas City • San Francisco **THE S. E. MASSENGILL COMPANY**

A flexible dosage form for predictable effect



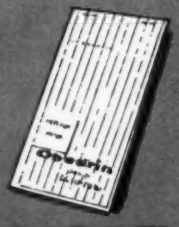
Obedrin tablets provide a flexible dosage form which may be prescribed to depress the appetite at peak hunger periods.

The pentobarbital content assures minimal central nervous stimulation, and the 60-10-70 Basic Plan provides for a balanced food intake with sufficient protein and roughage.

Obedrin is available in tablet and capsule form.

Advantages of Obedrin

An effective anorexigenic agent
A flexible dosage form
Minimal central nervous stimulation
Vitamins to supplement the diet
No hazards of impaction



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and the 60-10-70 Basic Plan

Bristol, Tennessee New York Kansas City San Francisco

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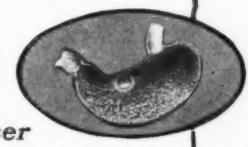
SATISFACTORY REDUCTION OF GASTRIC SECRETION. Each patient has wide physiological and emotional tolerances to anticholinergics. Malcotran's wide dosage latitude facilitates regulation of your patient's dosage *according to his need, not his tolerance.*

Malcotran assures prompt arrest of gastro-intestinal motility – and reduction of gastric secretion.

MALCOTRAN®

for peptic ulcer



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CLIMATE AIDS IN THERAPY

SUNSHINE 360 DAYS OF THE YEAR!

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A MODERN HOSPITAL FOR EMOTIONAL READJUSTMENT

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• Modern Treatment Facilities • Psychotherapy Emphasized • Large Trained Staff • Individual Attention • Capacity Limited • Occupational and Hobby Therapy • Supervised Sports • Religious Services Plus . . .

Your patients spend many hours daily in healthful outdoor recreation, reviving normal interests and stimulating better appetites and stronger bodies . . . all on Florida's Sunny West Coast.

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Consultants in Psychiatry

SAMUEL G. WARSON, M.D. ROGER E. PHILLIPS, M.D

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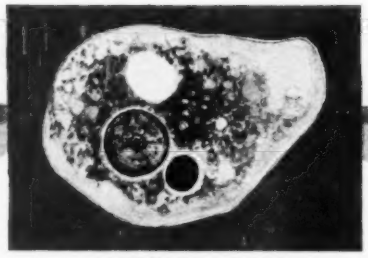
AMEBIASIS:
Intestinal and Extra-Intestinal



Amebiasis may be asymptomatic or may produce symptoms indicating low grade infection, inflammatory colonic disease with or without diarrhea, or symptoms resembling appendicitis, gallbladder disease, or peptic ulcer.[1]

"Frequently an unrecognized hepatitis coexists with intestinal amebiasis."[2]

For complete treatment of amebiasis, combined therapy with Milibis® and Aralen® is highly recommended.

① Intestinal amebic infestation

MILIBIS

—a powerful amebicide, virtually nontoxic and highly effective clinically. Its relative insolubility assures high concentration in the large intestine.

Supplied: 0.5 Gm. tablets — bottles of 25 and 500.

② Extra-intestinal amebiasis

ARALEN PHOSPHATE

—"specific for amebic hepatitis and amebic liver abscess."[2] As effective as emetine but without its toxicity.[3]

Supplied: 0.25 Gm. tablets — bottles of 100 and 1000.

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Milibis and Aralen, trademarks reg. U. S. Pat. Off., brand of bismuth glycolylarsanilate and chloroquine, respectively.

1. Sodeman, W. A., and Beaver, P. C.: *Am. Jour. Med.*, 12:440, Apr., 1952.
2. Zavala, D. C., and Hamilton, H. E.: *Ann. Int. Med.*, 36:110, Jan., 1952.
3. Conan, N. J.: *Am. Jour. Med.*, 6:309, Mar., 1949.

Continued from page 60

Cassady, Ashland, was elected Vice-President.

Dr. J. Farra Van Meter has been awarded the Lexington Optimist Club cup as Lexington's "Outstanding Citizen of 1957."

LOUISIANA

Dr. Cecil W. Clark, Cameron, has been elected "General Practitioner of the Year" by the American Medical Association for outstanding medical public relations accomplishment for 1957.

Dr. Emmanuel Farber, associate professor of pathology and biochemistry, Tulane University School of Medicine, received the second annual award of the American Society for Experimental Pathology for distinguished medical research.

Dr. Jack Wickstrom, New Orleans, was recently elected second Vice-President of the Association of Bone and Joint Surgeons.

Dr. Harry D. Morris, New Orleans, has been elected to the American Board of Orthopedic Surgery.

Dr. Sam Nadler, New Orleans, is the new Vice-

Continued on page 64

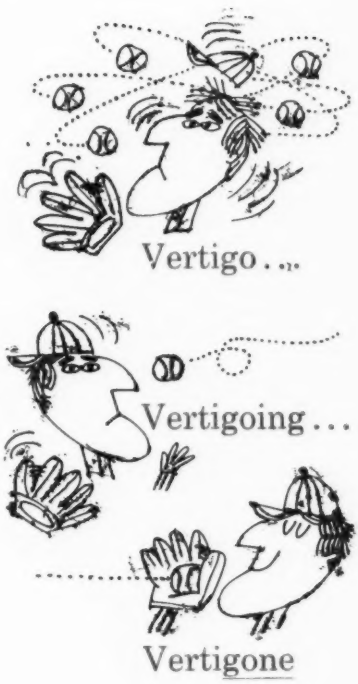
CLASSIFIED ADVERTISEMENTS

LOCATION AVAILABLE—January 1, 1959. Excellent location available for physician planning to do eye, ear, nose and throat. Office, records and complete office equipment available as doctor desires to retire. Practice well established in present location for 34 years. Contact M. B. Seligstein, M.D., 67 Madison Avenue, Memphis 3, Tennessee.

WANTED—PHYSICIAN—If, among your patients, you have recognized the response to anxieties and disappointments rather than physical agents causing their illness, if a practice in mental hygiene with regular hours and ability to plan your leisure, regular income and a chance to help these people, interests you, inquire what Veterans Administration Hospital has to offer you. Inquiries will be welcomed by the Veterans Administration Hospital, Tuscaloosa, Alabama. Attention of the Manager.

SURGICAL INSTRUMENTS FOR SALE—New condition or brand new, consisting of all necessary instruments for complete laporatomy; D&C set; circumcision set; delivery set with new Kielland forceps never used; complete new condition Spencer bright line Hemocytometer. Total retail value $866.04. Sacrifice all or none for $450.00 F. O. B. cash. All instruments guaranteed as described or retail price refunded for each instrument not meeting condition. List sent upon request. Contact CW c/o SMJ.

FOR SALE—Kentucky. Active, busy EENT practice. Immediate occupancy, due to sudden death of man established present location 33 years. Superbly equipped modern 14 room clinic, including X-ray department, latest refraction equipment. Draws from more than 70 mile radius. Reasonable, liberal terms. Contact Mrs. M. L. Gunn, Box 142, Harlan, Kentucky.



Antivert
stops vertigo

(*and a glance at the formula shows two reasons why*)

each ANTIVERT *tablet contains:*

Meclizine (12.5 mg.)
to ease vestibular distension

Nicotinic Acid (50 mg.)
for prompt vasodilation

ANTIVERT is particularly useful for the relief of dizziness in the elderly. Try ANTIVERT on your next vertiginous patient.

Dosage: one tablet before each meal. In bottles of 100 blue-and-white scored tablets. Rx only.

Roerig New York 17, New York
Division, Chas. Pfizer & Co., Inc.

Continued from page 63

President of the Southwestern Section of the American Society of Nuclear Medicine.

Dr. Jose L. Garcia-Oller, New Orleans, was elected a charter member of the recently founded Scientific Research Society of America, and also an associate member of the American Academy of Neurology.

Dr. Neal Owens, New Orleans, has been elected President of the Southeastern Society of Plastic and Reconstruction Surgeons. He was also elected Vice-President of the International College fo Surgeons.

New officers of the medical staff of the Crippled Children's Hospital are: President, Dr. Jack K. Wickstrom; Vice-President, Dr. Suzanne Schaefer; Secretary, Dr. Hyman R. Soboloff; and members of the executive committee, Drs. Rosalind Novick, Daniel C. Riordan and J. D. Russ, all of New Orleans.

The twenty-second annual meeting of The New Orleans Graduate Medical Assembly will be held March 2-5, 1959, headquarters at the Roosevelt Hotel. New officers and members of the Executive Committee are: President, Dr. J. O. Weilbaecher, Jr.; President-Elect, Dr. Ambrose H. Storck; First Vice-President, Dr. V. Medd Henington; Second Vice-President, Dr. W. E. Kittredge; Third Vice-President, Dr. Ralph M. Hartwell; Secretary, Dr. M. E. St. Martin; Treasurer, Dr. Boni J. DeLaureal; Director of Program, Dr. Robert F. Sharp; Assistant Director of Program, Dr. L. Sidney Charbonnet, Jr.; Assistant Director of Program, Dr. Mannie D. Paine, Jr.; and Executive Committee, Drs. Charles L. Brown, Hugh T. Beacham, H. Theo Brierre, Max M. Hattaway and George H. Hauser.

Recently elected officers for the Radiological Society of Louisiana are: President, Dr. J. T. Brierre, New Orleans; Vice-President, Dr. Jerome J. Romagosa, Lafayette; Secretary-Treasurer, Dr. Seymour Ochsner, New Orleans.

MARYLAND

Dr. Richard W. Trevaskis, Sr., Cumberland, has been elected Vice-President of the Duke Memorial Bible Class.

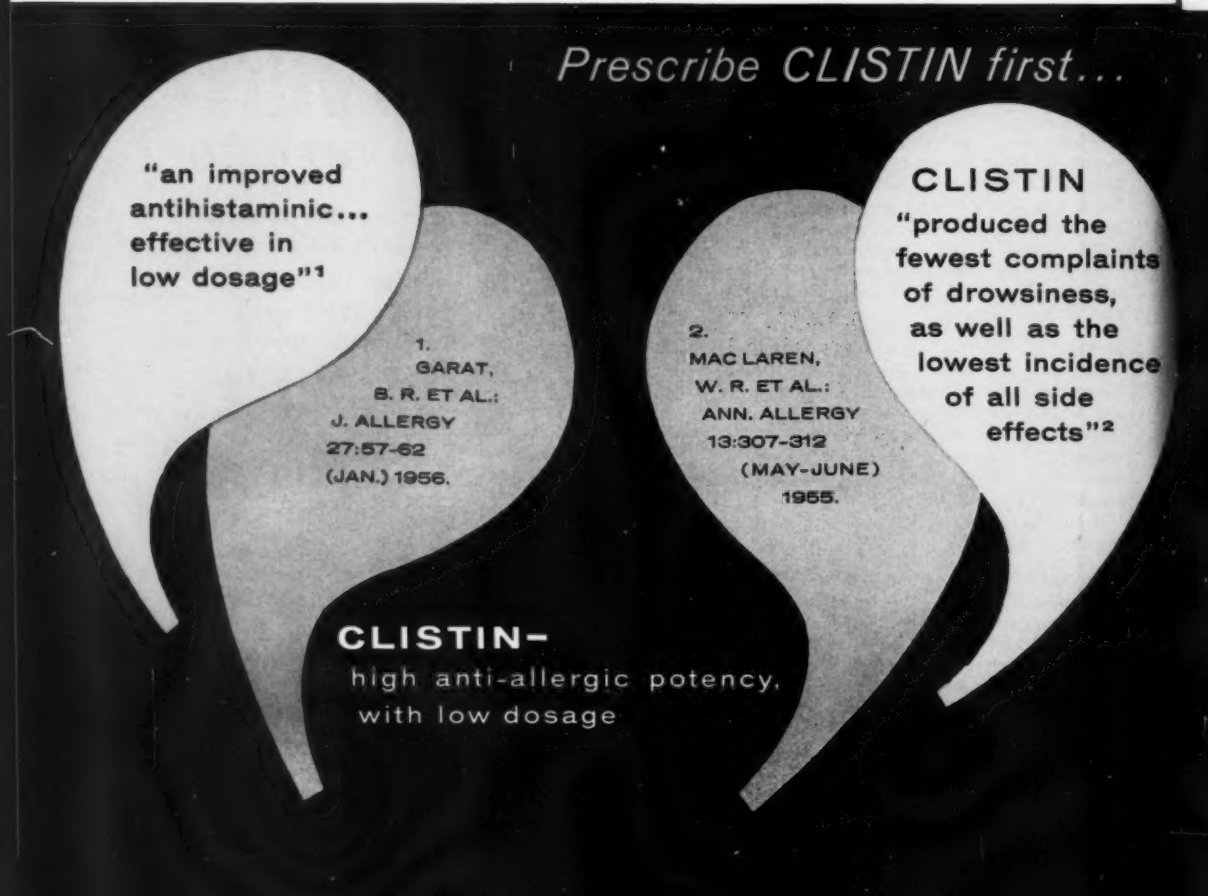
Dr. Samuel M. Jacobson, Cumberland, has been appointed Regional Chairman of the "Greater University of Maryland Fund."

Dr. Harry Eagle, Bethesda, has been elected President of the Society of American Bacteriologists.

Dr. Bernard B. Brodie, Edgewood, Chief, Laboratory of Chemical Pharmacology, National Heart Institute, has been awarded the Distinguished Service Award of the Department of Health, Education, and Welfare by Secretary Marion B. Folsom. Dr. Brodie was cited for his development of a new field in medicine, Chemical Pharmacology.

MISSOURI

New officers elected by the St. Louis Academy of General Practice are: Dr. Walter C. Gray, President; Dr. Eugene W. Hall, Vice-President; Dr. Charles A.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"an improved antihistaminic... effective in low dosage"1
1. GARAT, B. R. ET AL.: J. ALLERGY 27:57-62 (JAN.) 1956.
CLISTIN
"produced the fewest complaints of drowsiness, as well as the lowest incidence of all side effects"2
2. MAC LAREN, W. R. ET AL.: ANN. ALLERGY 13:307-312 (MAY-JUNE) 1955.
CLISTIN–
high anti-allergic potency, with low dosage

Molden, President-Elect; Dr. Vernon E. Michael, Treasurer; and Dr. Eugene V. Henschel, Secretary.

Dr. Thomas A. Dooley, St. Louis, is being honored with a dinner and "Doctor Dooley Day" by the International Rescue Committee.

Dr. A. N. Arneson, St. Louis, has been elected Treasurer of the American College of Obstetricians and Gynecologists. He was also appointed Chairman of the Radiation Hazards Committee.

Dr. Andrew J. Signorelli, St. Louis, was presented a plaque for his work as medical director and founder of Faith Hospital.

Dr. Grayson Carroll, St. Louis, has been re-elected Treasurer of the American Urological Association.

Dr. Mario Pianetto, Koch, was recently installed as President of the Missouri section of the American Trudeau Society.

Dr. Ernest Spitzer, University City, has been honored with a bronze plaque, engraved, "In recognition of your faithful service to this Society and of your valuable contributions to dermatology, this plaque is respectfully and affectionately awarded by the St. Louis Dermatological Society."

Dr. Richard A. Sutter, St. Louis, was invited by President Eisenhower to attend the President's 10th Anniversary Conference on Occupational Safety, held in Washington, D. C.

Recently elected President of the St. Charles Parents' Group for retarded children was Dr. Russell Crider, St. Charles.

Officers chosen by the medical staff of Jefferson Memorial Hospital are: Chief-of-Staff, Dr. Emmett J. Senn, Herculaneum; Vice-President, Dr. R. H. Donnell, Crystal City; and Secretary, Dr. J. Logan Mayfield, Crystal City.

NORTH CAROLINA

Dr. Walter Hollander, Jr., Assistant Professor in the Department of Medicine at the University of North Carolina School of Medicine, has been named a Markle Scholar.

Officers of the First District Medical Society are: Dr. William Romm, Moyock, President; Dr. Charles Wright, Jarvisburg, Vice-President; and Dr. Fletcher Bailey, Elizabeth City, Secretary-Treasurer.

The North Carolina Surgical Association held its spring meeting at The Homestead, Hot Springs, Virginia, on April 17th, 18th, and 19th, 1958.

OKLAHOMA

Dr. Max M. Van Sandt has been assigned to the Office of Defense Mobilization where he will serve as Chairman of the Health Manpower Task Force.

Dr. Charles E. Wilbanks, Tulsa, was elected President of the Oklahoma chapter of the American Academy of General Practice. Other officers include: President-Elect, Dr. Roger Reid, Ardmore; Vice-President,

Continued on page 68

for Alert Allergics

CLISTIN®

carbinoxamine maleate

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Tablets Clistin, 4 mg.

Tablets Clistin R-A (Repeat Action) 8 mg. (orange) and 12 mg. (yellow)

Elixir Clistin, 4 mg. per 5 cc.

Prolonged relief *New 12 mg. Clistin R-A (Repeat Action)* One tablet provides all-day or all-night relief.

McNeil Laboratories, Inc., Philadelphia 32, Pa.

YOU'VE said good-by to the bride who was once your little girl, and to that handsome boy who is now your son. The youngsters are on their own: and so, after twenty-odd years, are you! Now is the time to think of yourselves—your pleasures, your security, your eventual retirement. A good time to start putting part of your savings away in safe, sure, United States Savings Bonds. Where nothing can touch your principal. And where your money earns 3¼% when bonds are held to maturity. Series E Bonds grow in value, year by year—and Series H Bonds pay you interest twice a year. Whichever you choose, start your bond program today! When financial independence counts, count on U. S. Savings Bonds!

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running noses . . .

and other hay fever symptoms

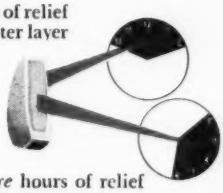
TRIAMINIC stops rhinorrhea, congestion and other distressing symptoms of summer allergies, including hay fever. Running nose, watery eyes and sneezing are best relieved by antihistamine *plus* decongestant action – systemically – with TRIAMINIC.

This new approach frequently succeeds where less complete therapy has failed. It is not enough merely to use histamine antagonists; ideally, therapy must be aimed also at the congestion of the nasal mucosa. Triaminic provides such effective combined therapy in a single timed-release tablet.

TRIAMINIC brings relief in minutes—lasts for hours. Running noses stop, congested noses open—and stay open for 6 to 8 hours.

Triaminic provides around-the-clock freedom from allergic congestion with just one tablet t.i.d. because of the special timed-release design.

first—3 to 4 hours of relief from the outer layer



then—3 to 4 *more* hours of relief from the inner core

Dosage: One tablet in the morning, mid-afternoon and at bedtime. In postnasal drip, one tablet at bedtime is usually sufficient.

Each timed-release TRIAMINIC Tablet contains:

Phenylpropanolamine HCl	50 mg.
Pheniramine maleate	25 mg.
Pyrilamine maleate	25 mg.

TRIAMINIC FOR THE PEDIATRIC PATIENT

TRIAMINIC Juvelets*, providing easy-to-swallow half-dosages for the 6- to 12-year-old child, with the timed-release construction for prolonged relief.

*Trademark

TRIAMINIC Syrup, for those children and adults who prefer a liquid medication. Each 5 ml. teaspoonful is equivalent to ¼ Triaminic Tablet or ½ Triaminic Juvelet.

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(Organic diseases of the nervous system, psychoneuroses, psychosomatic disorders, mood disturbances, social adjustment problems, involutional reactions and selective psychotic and alcoholic problems.)

DR. HOWARD R. MASTERS DR. JAMES ASA SHIELD
DR. WEIR M. TUCKER DR. GEORGE S. FULTZ, JR.
DR. AMELIA G. WOOD DR. ROBERT K. WILLIAMS

Continued from page 65

Dr. Robert T. Sturm, Lee; and Secretary-Treasurer, V. M. Rutherford, Midwest City.

SOUTH CAROLINA

Dr. Edward Martinat and Dr. Wayne Brady are new members of the American Board of Orthopedic Surgery.

Dr. L. L. Richardson has been re-elected Mayor of Simpsonville and began his 42nd year in that capacity January 1, 1958.

Dr. Sam D. Reid, Chesnee, was named "Doctor of the Year" by the Spartanburg County Medical Society.

Dr. J. J. Cleckley was recently elected President of the South Carolina Branch of the American Psychiatric Association. Other officers include: Dr. Joe E. Freed, President-Elect; and Dr. Joseph H. Marshall, Secretary-Treasurer, all of Charleston.

New President for the South Carolina Surgical Society is Dr. Karl M. Lippert, Charleston.

Dr. Austin Talley Moore, Columbia, will receive an honorary Doctor of Law degree as a nationally known orthopedic surgeon.

Dr. P. F. LaBorde, Charleston, was recently appointed a member of the Board of Directors of the Red Cross Blood Bank.

TENNESSEE

Dr. R. H. Kampmeier, Nashville, received the state medical association's award as Tennessee's "Physician

Continued on page 70

EFFECTIVE CONTROL OF HYPERMOTILITY. Each patient has wide physiological and emotional tolerances to anticholinergics. Malcotran's wide dosage latitude facilitates regulation of your patient's dosage *according to his need, not his tolerance.*

Malcotran assures prompt arrest of gastro-intestinal motility — and reduction of gastric secretion.

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an entirely new concept in broad-spectrum therapy

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1. Higher, faster antibiotic blood levels[1]
2. More consistently elevated antibiotic blood levels[2]
3. Effective, well-tolerated broad-spectrum therapy[3, 4, 5]
4. Safe, physiological potentiation with glucosamine, a nontoxic human metabolite[6, 7, 8]

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*TRADEMARK

Continued from page 68

of the Year." Dr. Kampmeier is Head of the Department of Medicine at Vanderbilt University School of Medicine and also Editor of the *Southern Medical Journal*.

Dr. John B. Youmans will resign his position as dean of Vanderbilt University School of Medicine to become head of medical research for the U. S. Army.

Dr. L. Spires Whitaker, Chattanooga, will be the new Medical Director of the Pine Breeze Sanatorium.

Dr. J. Murry Davis, Memphis, has been presented a special award by the Civitan Club in recognition of his "unselfish, loyal and civic service."

Dr. B. C. Smoot is the new President of McMinnville Rotary Club; President of the Millington Rotary Club is Dr. B. W. King.

Drs. Charles C. Elliott, Richard S. Yocum, Elizabeth Dowell, William H. Hatfield, and Charles E. Strickland have been appointed as assistants on the staff of the University of Tennessee College of Medicine.

Dr. Lucius E. Burch has been elected President and Dr. Benjamin F. Byrd, Secretary of the recently organized Vanderbilt Medical Association.

The governor recently appointed Dr. Carroll Long, Johnson City, and Dr. Charles C. Stauffer, Jackson, to the State Board of Nursing.

Dr. J. Paul Lindsay, Nashville, has been named to the Board of Directors of the American Academy of General Practice.

Dr. Cyrus C. Erickson, Memphis, has been named a lecturer at the Michigan Clinical Institute.

Dr. C. D. Hawkes, Memphis, has been re-elected Secretary of the Southern Neurosurgical Society.

New chairman of the medical advisory committee for the Visiting Nurses Association of Memphis is Dr. Hall S. Tackett, Memphis.

New Officers for the Hawkins County Medical Society are: Dr. James S. Lyons, President; Dr. C. C. Johnson, Vice-President; and Dr. W. E. Gibbons, Secretary, all of Rogersville.

TEXAS

Dr. Curtice Rosser of Dallas has received another high professional honor—a life membership in the Golden Key Society of the University of Vienna. The Golden Key is awarded to only two physicians in the world each year, for outstanding scientific contributions to the profession.

Dr. Lester J. Reed, Galveston, recently received an award in biological chemistry from the Eli Lilly and Company.

Dr. Joseph L. Melnick was recently named Professor of Virology and Epidemiology and Chairman of the Department of Epidemiology at Baylor University College of Medicine.

Dr. Howard O. Smith, Marlin, has become the ninety-second President of the Texas Medical Association.

Dr. William P. Ball, Cleburn, was elected "General

Continued on page 72

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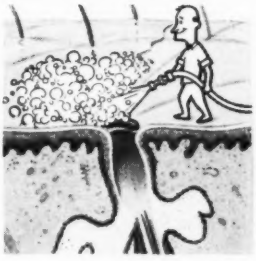

Fostex contains a combination of surface active agents (Sebulytic*) which:

◂ Completely emulsify excess oil so that it is quickly washed off the skin.

◂ Penetrate and soften comedones, unblocking the pores and facilitating removal of sebum plugs.

Fostex dries and peels the skin

◂ The Sebulytic base of Fostex dries and promotes peeling of the skin . . . actions enhanced by the keratolytic effects of micropulverized sulfur and salicylic acid.

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for therapeutic washing of skin in the initial phase of acne treatment, when maximum degreasing and peeling are desired.

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for maintenance therapy to keep skin dry and substantially free of comedones.

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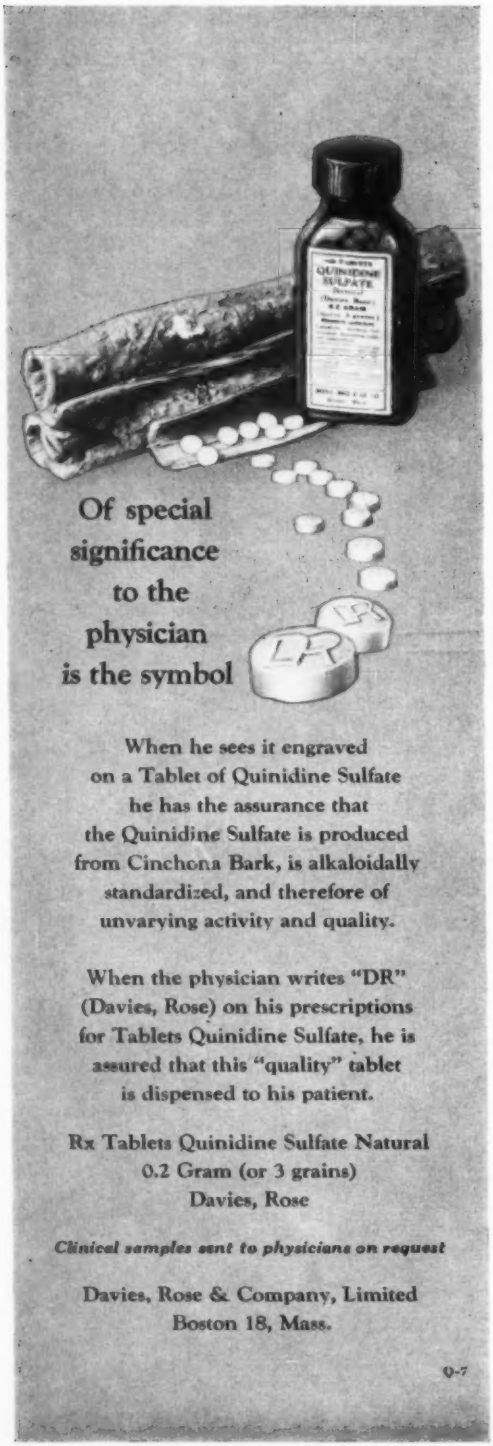
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Continued from page 70

Practitioner of the Year" by the Texas Medical Association.

Dr. Hugh E. Wilson, Dallas, has been named one of the five outstanding young men of Texas for 1957 by the Texas Junior Chamber of Commerce.

Dr. John T. Martin was recently appointed to the staff of the Mayo Clinic as a consultant in anesthesiology.

New Texas Medical Association officials include: Dr. Franklin W. Yeager, Corpus Christi, President-Elect; Vice-President, Dr. C. E. Willingham, Tyler; Speaker of the House of Delegates, Dr. C. P. Hardwicke, Austin; Vice-Speaker of the House, Dr. James D. Murphy, Fort Worth; and member of the Board of Trustees, Dr. Byron P. York, Houston.

VIRGINIA

New officers of the Virginia Society of Ophthalmology and Otolaryngology are: Dr. Calvin T. Burton, Roanoke, President; Dr. Maynard P. Smith, Richmond, President-Elect; Dr. William C. Anderson, Winchester, Vice-President; and Dr. Marion K. Humphries, Charlottesville, Secretary-Treasurer.

Dr. James W. Sinclair, Warrenton, was recently presented a scroll which read as follows: "To Dr. James Ward Sinclair: In Witness that the Operating Room of the Fauquier Hospital is equipped as a mark of the enduring appreciation and affection of his patients and friends." The patients and friends of Dr. Sinclair contributed over $11,000.00 with which to purchase operating equipment.

Drs. Alto Feller, Charlottesville, and Harry C. Foster, Martinsville, have been appointed to the Medical Advisory and Research Committee of the Virginia Heart Association. Dr. Reverdy H. Jones, Jr., Roanoke, is chairman of the committee.

Dr. John A. Sims, Alexandria, has been presented the fifth Douglas Southall Freeman award by the Virginia Tuberculosis Association. This award is the highest honor conferred upon those who have contributed significantly to the control of tuberculosis in Virginia by the Association.

Dr. Edwin P. Jordan, Charlottesville, was recently elected President of the Thomas Jefferson chapter of the Sons of the American Revolution.

Dr. William S. Jordan, Jr., has been appointed Professor of Preventive Medicine and Chairman of the Department of Preventive Medicine and Professor of Internal Medicine at the University of Virginia School of Medicine.

WEST VIRGINIA

Dr. Joseph M. Farrell, Huntington, has been elected President of the West Virginia State Society of Internal Medicine. Dr. Pat A. Tuckwiller, Charleston, has been named President-Elect; and Dr. Rowland H. Burns, Huntington, Secretary-Treasurer. Named to the Council are Drs. Adam B. C. Ellison, and William A. Thornhill, Jr., Charleston, and William E. Bray, Jr., and Walter E. Vest, Huntington.

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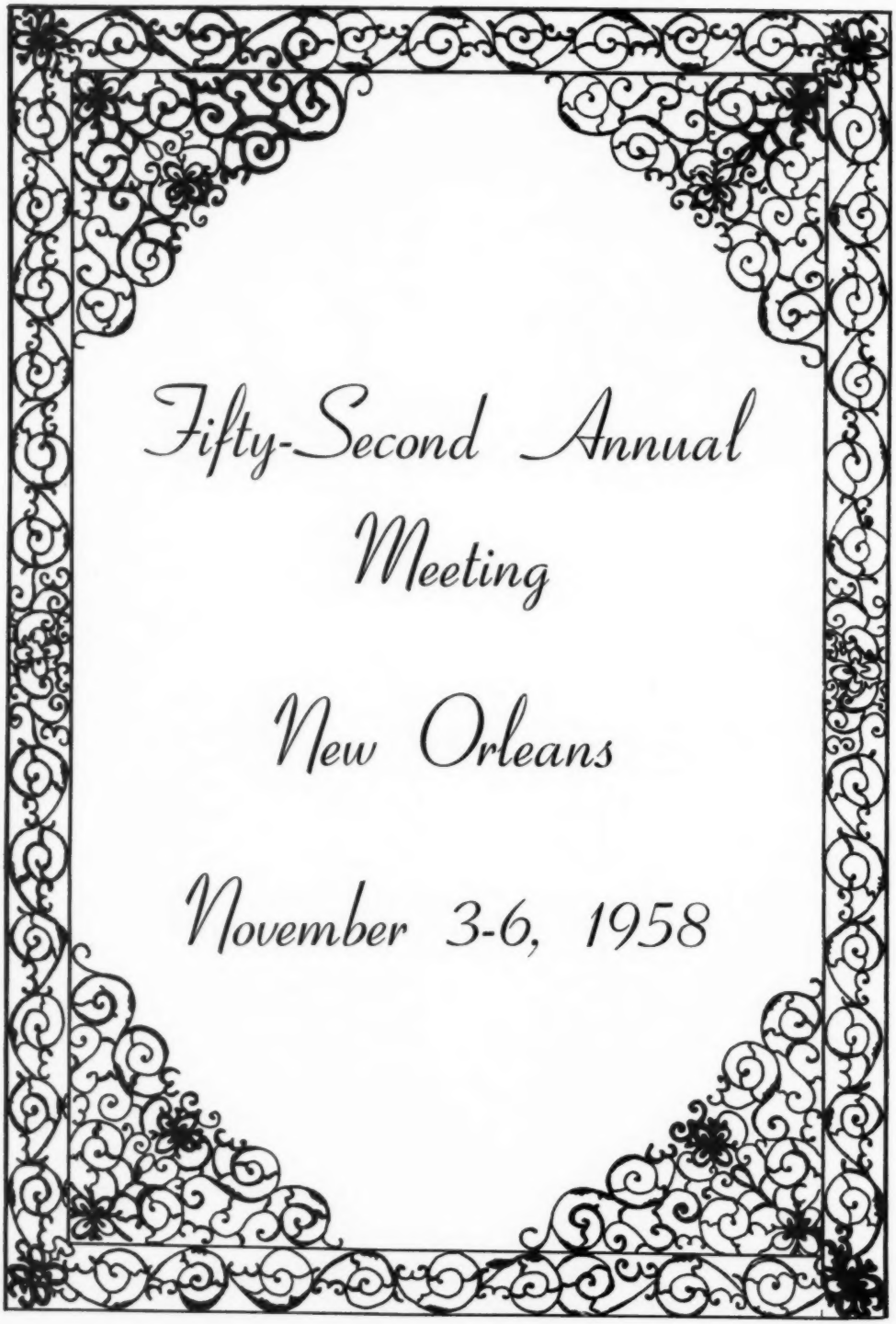
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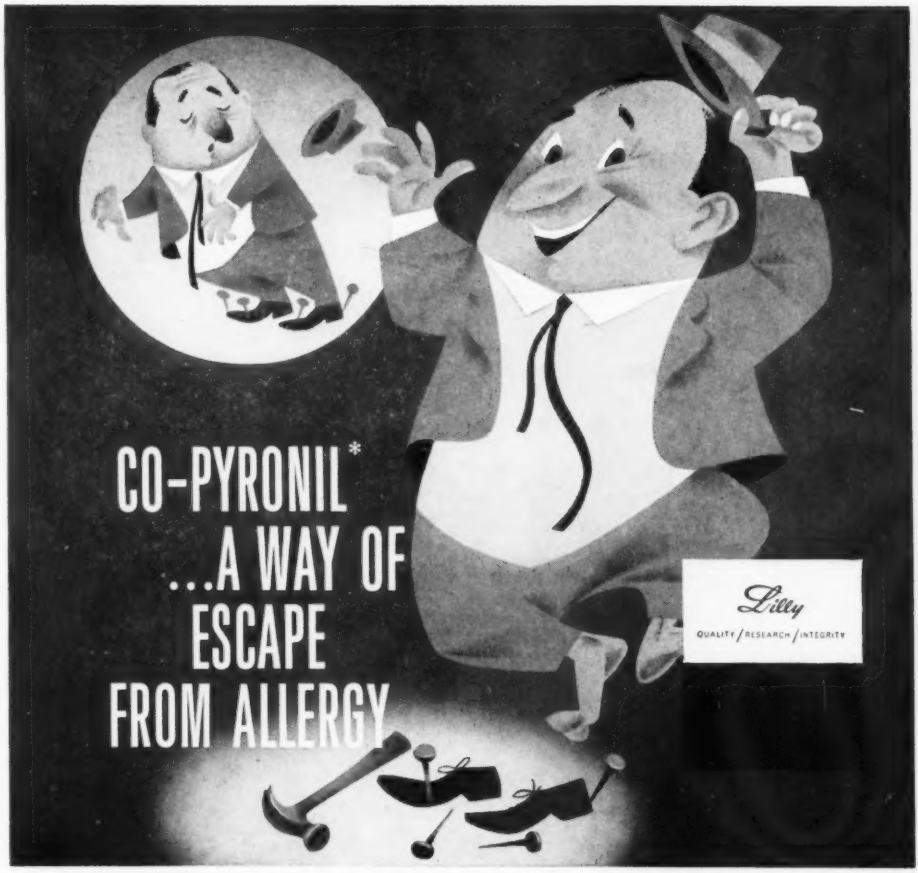

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